BSM- 9510J
BSM- 9510K

MU- 950RJ
MU- 950RK
RY- 002PA
AY- 900PA
AY- 910PA
AA- 900PA
WS- 920PA
EK- 900P

Life Scope M
BEDSIDE MONITOR

BSM-9510

0634-001352

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Conventions Used in this Manual and Instrument

Warnings, Cautions and Notes

Warnings, cautions and notes are used in this manual to alert or signal the reader to specific information.

WARNING

A warning alerts the user to possible injury or death associated with the use or misuse of the instrument.

CAUTION

A caution alerts the user to possible injury or problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument, or damage to other property.

NOTE

A note provides specific information, in the form of recommendations, prerequirements, alternative methods or supplemental information.

Explanations of the Symbols in this Manual and Instrument

The following symbols found in this manual/instrument bear the respective descriptions as given.

On panels

Symbol	Description	Symbol	Description
	Standby lamp		Type BF applied part
	“On” only for a part of equipment	IPX4	Splash-proof equipment
	“Off” only for a part of equipment	IPX7	Watertight equipment
	Alternating current		Year of manufacture
	Equipotential terminal	SN	Serial number
	Attention, consult operator’s manual		Fuse
	Alarm off/suspend		High voltage
	Output terminal		Protective earth
	Defibrillation-proof type CF applied part		The CE mark is a protected conformity mark of the European Community. The products herewith comply with the requirements of the Medical Device Directive 93/42/EEC.
	Type CF applied part		
	Defibrillation-proof type BF applied part		

On screen

Symbol	Description	Symbol	Description
	Open pulldown menu		Alarm off/suspend
	Close window button		Alarm off/suspend with remaining time
	QRS sync mark		Arrhythmia analysis off

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Introduction

This service manual provides useful information to qualified personnel to understand, troubleshoot, service, maintain and repair the BSM-9510J/K Bedside Monitor (referred to as “the instrument” in this service manual).

All replaceable parts or units of this instrument are clearly listed with exploded illustration to help you locate the parts quickly.

The “Maintenance” section in this service manual describes the maintenance that should be performed by qualified service personnel. The “Maintenance” section in the operator’s manual describes the maintenance that can be performed by the user.

The information in the operator’s manual is primarily for the user. However, it is important for service personnel to thoroughly read the operator’s manual and service manual before starting to troubleshoot, service, maintain or repair this instrument. This is because service personnel need to understand the operation of the instrument in order to effectively use the information in the service manual.

General Information on Servicing

Note the following information when servicing the instrument.

CAUTIONS

Safety

- **There is the possibility that the outside surface of the instrument, such as the operation keys, could be contaminated by contagious germs, so disinfect and clean the instrument before servicing it. When servicing the instrument, wear rubber gloves to protect yourself from infection.**
- **There is the possibility that when the lithium battery is broken, a solvent inside the lithium battery could flow out or a toxic substance inside it could come out. If the solvent or toxic substance touches your skin or gets into your eye or mouth, immediately wash it with a lot of water and see a physician.**

Liquid ingress

The instrument is not drip-proof, so do not install the instrument where water or liquid can get into or fall on the instrument. If liquid accidentally gets into the instrument or the instrument accidentally drops into liquid, disassemble the instrument, clean it with clean water and dry it completely. After reassembling, verify that there is nothing wrong with the patient safety checks and function/performance checks. If there is something wrong with the instrument, contact your Nihon Kohden representative to repair.

Environmental Safeguards

Depending on the local laws in your community, it may be illegal to dispose of the lithium battery and CRT unit in the regular waste collection. Check with your local officials for proper disposal procedures.

Disinfection and cleaning

To disinfect the outside surface of the instrument, wipe it with a non-abrasive cloth moistened with any of the disinfectants listed below. Do not use any other disinfectants or ultraviolet rays to disinfect the instrument.

- **Chlorohexidine gluconate solution: 0.5%**
- **Benzethonium chloride solution: 0.2%**
- **Glutaraldehyde solution: 2.0%**
- **Benzalkonium chloride: 0.2%**
- **Hydrochloric alkyl diaminoethylglycine: 0.5%**

Transport

• Use the specified shipment container and packing material to transport the instrument. If necessary, double pack the instrument. Also, put the instrument into the shipment container after packing so that the buffer material does not get into the inside of the instrument.

• When transporting the board or unit of the instrument, be sure to use a conductive bag. Never use an aluminum bag when transporting the power board, power unit or board on which a lithium battery is mounted. Also, never use a styrene foam or plastic bag which generates static electricity to wrap the board or unit of the instrument.

Handling the instrument

• Because the outside surface of the instrument is made of resin, the outside surface of the instrument is easily damaged. So when handling the instrument, remove clutter from around the instrument and be careful to not damage the instrument or get it dirty.

• Because most of the boards in the instrument are multilayer boards with surface mounted electrical devices (SMD), when removing and soldering the electrical devices, a special tool is required. To avoid damaging other electrical components, do not remove and solder SMD components yourself.

Measuring and Test Equipment

Maintain the accuracy of the measuring and test equipment by checking and calibrating it according to the check and calibration procedures.

Service Policy, Service Parts and Patient Safety Checks

Service Policy

Our technical service policy for this instrument is to replace the faulty unit, board or part or damaged mechanical part with a new one. Do not perform electrical device or component level repair of the multilayer board or unit. We do not support component level repair outside the factory for the following reasons:

- Most of the boards are multilayer boards with surface mounted electrical devices, so the mounting density of the board is too high.
- A special tool or high degree of repair skill is required to repair the multilayer boards with surface mounted electrical devices.

Disassemble the instrument or replace a board or unit in an environment where the instrument is protected against static electricity.

As background knowledge for repair, pay special attention to the following:

- You can reduce the repair time by considering the problem before starting repair.
- You can clarify the source of most of the troubles using the information from the diagnostic check function of the instrument. Refer to “Diagnostic Check “ of this manual.

Service Parts

Refer to “Replaceable Parts List” of this manual for the service parts for technical service that we provide.

NOTE

When ordering parts or accessories from your Nihon Kohden representative, please quote the NK code number and part name which is listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs. Always use parts and accessories recommended or supplied by Nihon Kohden Corporation to assure maximum performance from your instrument.

Patient Safety Checks

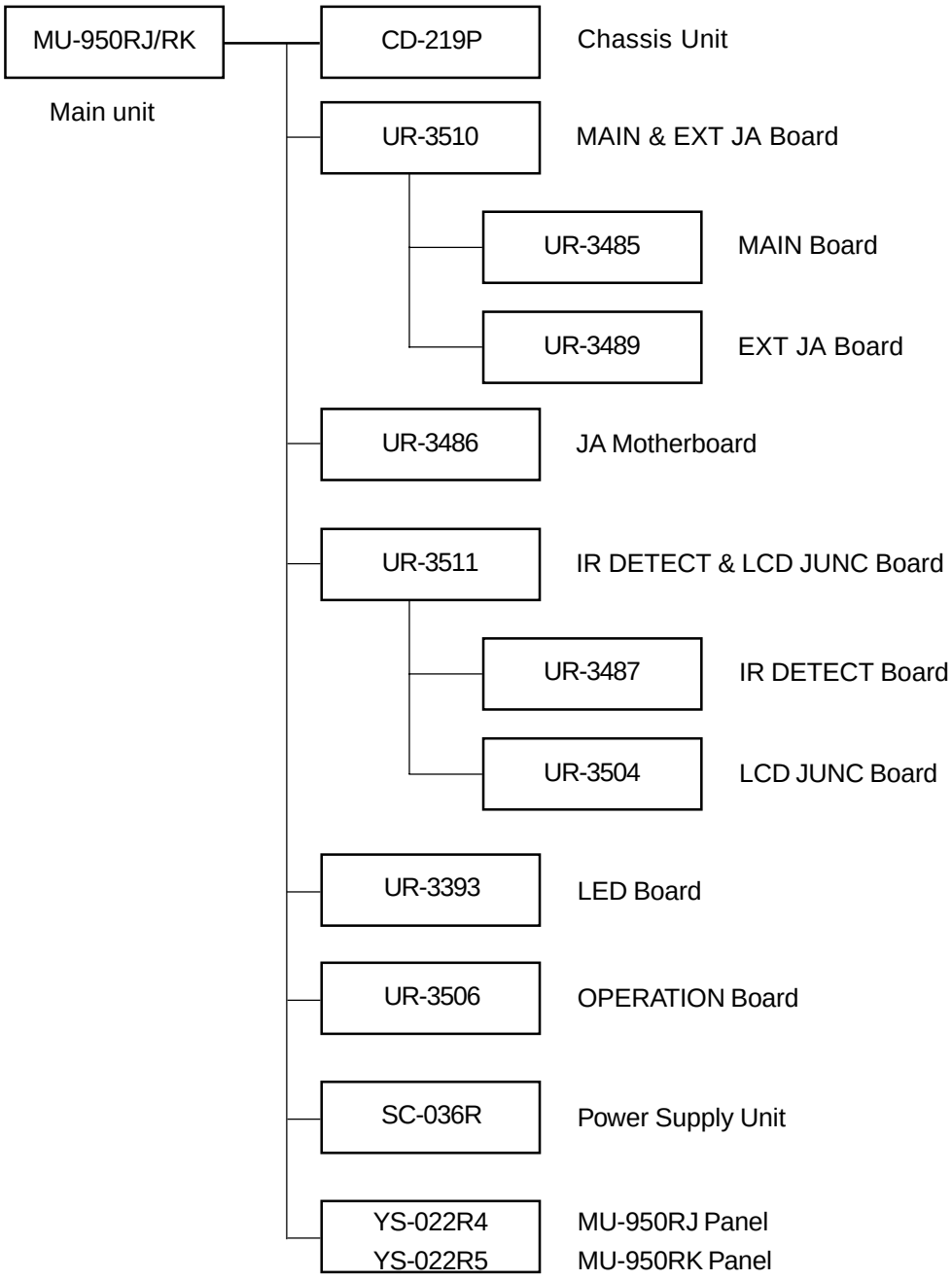
Periodic maintenance procedures and diagnostic check procedures are provided in this manual to ensure that the instrument is operating in accordance with its design and production specifications. To verify that the instrument is working in a safe manner with regard to patient safety, patient safety checks should be performed on the instrument before it is first installed, periodically after installation, and after any repair is made on the instrument.

For patient safety checks, perform the following checks as described in the International Electrotechnical Commission's standard, IEC60601-1 (1988):

- Protective earth resistance check
- Earth leakage current check
- Enclosure leakage current check
- Patient leakage current check
- Withstanding voltage check

Composition

Bedside Monitor Main Unit



Specifications

Bedside Monitor Main Unit, MU-950RJ/RK

For other details, refer to the specifications of the respective module and unit.

Sound

Sound type:	Alarm, synchronization, click
Alarm sound:	Volume variable
Synchronization sound:	Volume variable, pitch variable for SpO_2 or BP
Click sound:	Volume variable

Alarm

Alarm items:	Upper/lower limits alarm, apnea alarm, arrhythmia alarm, module alarm, external instrument alarm, electrode check alarm, faulty instrument alarm, connector disconnection alarm, operating environment alarm
Alarm types:	Crisis (red, blinking), Warning (yellow, blinking), Advisory (yellow, lighting), Message, System Guidance
Alarm indication:	Alarm indicator, highlighted numerical display, numerical display color, alarm sound, highlighted message for arrhythmia
Alarm suspend:	Provided (For 1, 2, 3, 4, 5, 10 min)
Alarm silence:	Provided (For 1, 2, 3, 4, 5, 10 min)
Alarm setting:	Individual upper/lower limits setting for each parameter

Display

Sweep speed:	Respiration wave (respiration, CO_2): 6 or 25 mm/s Others: 25 mm/s
Display waveforms:	ECG, IBP, ICP, SpO_2, Respiration wave, CO_2 and other parameters depending on the module and unit
Numerical data display:	Heart rate, VPC rate, arrhythmia message, ST level, IBP (systolic, diastolic, mean), NIBP (systolic, diastolic, mean), respiration rate, pulse rate, temperature, SpO_2, CO_2, O_2, and other parameters depending on the module and unit.
Synchronization mark:	Heart rate sync mark, pulse rate sync mark
Trendgraph display time:	30 min, 1, 2, 4, 6, 8, 12 or 24 h
Display size:	10.4 inch
Viewing area:	211 × 158 mm
Resolution:	640 × 480 dots
Max. No. of waveform traces:	6 traces
Sweep time:	about 6 s (When sweep speed is 25 mm/s)
Waveform display mode:	Moving mode

Module Slots

No. of slots:	6

Multi Parameter Module, AY-900PA

ECG

- Electrode offset potential tolerance: ± 500 mV
- Input dynamic range: ±10 mV
- Internal noise: ≤ 20 μVp-p, referred to input
- Input impedance: ≥ 5 MΩ (at 10 Hz)
- Common Mode Rejection Ratio: ≥ 95 dB (with a 51 kΩ/47 nF imbalance)
- Input bias current: ≤ 100 nA
- Heart rate count
  - Calculation method: 8-beat moving average/Instantaneous beat-to-beat (consecutive 2 beats averaged) (Selectable)
  - Counting range: 15 to 300 beats/min
- Arrhythmia analysis
  - Analysis method: Multi-template matching method
  - No. of channels: 2 channels
  - VPC counting range: 0 to 99 beats/min
  - Arrhythmia analysis: ASYSTOLE, V FIB, Vf/VT, V TACHY, VPC RUN, COUPLET, EARLY V, BIGEMINY, FREQ VPC, TACHY, BRADY, PROLONGED RR
- Arrhythmia recall
  - Number of recall files: 32
  - Storage time per file: 8 s
- ST level measurement
  - No. of measurement channels: 3-electrode: 1 ch
6-electrode: max. 8 ch
10-electrode: max. 12 ch
  - Measuring range: ±2.5 mV
- Pacemaker pulse rejection capability: ANSI/AAMI EC 13-1992 compatible
- Defibrillation-proof: ECG input protected against 400 J discharge
- ESU interference filter: Provided
- AC hum filter: Provided
- Lead
  - 3-electrode cable: I, II, III
  - 6-electrode cable: I, II, III, aV_R, aV_L, aV_F, Va, Vb (Va and Vb: any 2 leads from chest leads)
  - 10-electrode cable: I, II, III, aV_R, aV_L, aV_F, V1 to V6
- ECG frequency range
  - Signal bandwidth: DC to 90 Hz
  - Display bandwidth:

Filter	Drift free	
Off	Off	0.3 to 70 Hz
On	Off	0.3 to 20 Hz
Off	On	1.0 to 70 Hz
On	On	1.0 to 20 Hz

- Waveform display

Display sensitivity:	10 mm/mV ±5% (at × 1 sensitivity)
Sensitivity control:	×1/4, ×1/2, ×1, ×2, ×4 or AUTO
Drift rejection filter:	Available
Pacing spike display:	Available
Auto positioning:	Available

- Heart rate display update cycle: Every 3 s or when alarm is generated
- Alarm

Upper limit range:	20 to 300 beats/min in 5 beats/min steps, OFF
Lower limit range:	OFF, 15 to 295 beats/min in 5 beats/min steps
Alarm items:	TACHY, BRADY

Respiration (Transthoracic impedance pneumography)

- Measuring impedance range: ≥ 2 kΩ
- Internal noise: ≤ 0.1 Ω
- Excitor current: 30 ±10 μArms at 40 kHz
- Frequency response: 0.1 to 3 Hz (–3 dB)
- Respiration counter

Counting range:	0 to 150 breaths/min
Apnea setting range:	5 to 40 s (set on the main unit)

- Defibrillation proof: Respiration input protected against 400 J discharge
- Waveform display

Display sensitivity:	10 mm/Ω (at × 1 sensitivity)
Sensitivity control:	×1/4, ×1/2, ×1, ×2, ×4 or AUTO

- Respiration rate display update cycle: Every 3 s or when alarm is generated
- Alarm

Upper limit range:	2 to 150 breaths/min in 2 breaths/min steps, OFF
Lower limit range:	OFF, 0 to 148 breaths/min in 2 breaths/min steps
Apnea time:	5 to 40 s in 5 s steps, OFF

SpO_2 and Pulse Wave (Arterial Plethysmographic Waveform)

With Nihon Kohden probe

- Measuring range

SpO_2:	1 to 100% SpO_2 in 1% SpO_2 steps
Pulse rate:	30 to 300 beats/min

- SpO_2 accuracy

80 to 100% SpO_2:	±2% SpO_2
50 to 79% SpO_2:	±3% SpO_2

- SpO_2 display

Pulse rate display update cycle:	Every 3 s or when alarm is generated
Sync tone modulation:	Changes in 20 steps at 81 to 100% SpO_2

- Alarm

Upper limit range:	OFF, 51 to 100% SpO_2 in 1% SpO_2 steps
Lower limit range:	OFF, 50 to 99% SpO_2 in 1% SpO_2 steps

Non-invasive Blood Pressure, NIBP

- Measuring method: Oscillometric
- Cuff pressure display range: 0 to 300 mmHg (0 to 40 kPa)
- Accuracy
  - 0 to 200 mmHg: ±3 mmHg
  - 200 to 300 mmHg: ±4 mmHg
- Safety
  - Maximum pressurization value cuff inflation limiter: Adult 300 mmHg
    Neonate 150 mmHg
  - Cuff inflation time limiter: Adult 150 s
    Neonate 80 s
- Measurement mode: Manual (Single measurement)
  Continuous (Successive repetition or at 1 min interval for 15 min period)
  Periodic (In OR mode at 2, 2.5, 5, 10, 15, 30 min interval)
  (In ICU mode at 5, 10, 15, 30 min, 1, 2, 4, 8 h interval)
- NIBP data display update cycle: Updated every measurement
- Measurement end sound: Generated when measurement ends (Set on the System Setup screen)
- Alarm (Systolic, Diastolic, Mean)
  - Upper limit range: 22 to 250 mmHg in 2 mmHg steps, OFF
  - Lower limit range: OFF, 20 to 248 mmHg in 2 mmHg steps

Multi Amplifiers

- Measuring parameters: IBP, Temp, CO, Resp (thermistor), FiO_2, CO_2 (main stream)
- Input impedance: 1 MΩ

Invasive Blood Pressure, IBP

- Measuring range: −50 to 300 mmHg
- Measuring accuracy ±1% (≥ 100 mmHg), ±1 mmHg (< 100 mmHg)
- Auto zero balancing range: ±200 mmHg
- Auto zero balancing accuracy: ±1 mmHg
- Pulse rate counting range: 30 to 300 beats/min
- Pulse rate counting accuracy: ±1 beat/min
- Noise: ≤ 0.25 mmHg
- Temperature zero drift: ±0.1 mmHg/°C
- Frequency response: DC to 10/20 Hz, set on the main unit (Digital filter processing by software)
- Blood pressure display range: 0 to 300 mmHg
- Display update cycle: Every 3 s or when alarm is generated
- BP tone: Provided, systolic value 20 to 120 mmHg, changes in 20 steps every 5 mmHg

- Alarm (Systolic, Diastolic, Mean)

Upper limit range:	2 to 300 mmHg in 2 mmHg steps, OFF
Lower limit range:	OFF, 0 to 298 mmHg in 2 mmHg steps

Temperature

- Measuring range: 0 to 45°C (32 to 113°F)
- Measuring accuracy

Sensor:	±0.1°C
Module:	±0.1°C (25 to 45°C, 77 to 113°F) ±0.2°C (Other range)

- Noise: ≤ 0.014°C at 37°C (99°F)
- Temperature drift: ±0.005°C/°C
- Temperature display

Display range:	0 to 45°C (32 to 113°F)
Display update cycle:	Every 3 s

- Alarm

Upper limit range:	0.1 to 45°C (33 to 113°F) in 0.1°C (0.5°F) steps, OFF
Lower limit range:	OFF, 0 to 44.9°C (32 to 112°F) in 0.1°C (0.5°F) steps

Cardiac Output, CO

- Measuring method: Thermodilution method
- Measuring range

Injectate temperature (Ti):	0 to 27°C (32 to 81°F)
Blood temperature (Tb):	15 to 45°C (59 to 113°F)
Thermodilution curve (Δ Tb):	0 to 2.5°C (32 to 36.5°F)
Cardiac output (CO):	0.5 to 20 L/min

- Measuring accuracy (catheter sensor accuracy is not included)

Ti:	±0.1°C
Tb 25 to 45°C:	±0.1°C
Tb 15 to 25°C:	±0.2°C
CO:	±5%

- Noise

Ti:	≤ 0.025°C
Tb:	≤ 0.016°C at 37°C (99°F)
ΔTb:	≤ 0.005°C at 37°C (99°F)

- Temperature drift

Ti:	±0.005°C/°C
Tb:	±0.005°C/°C

- Frequency response (ΔTb): 0 to 3 Hz (Digital filter processing)
- Catheter size: 5F, 7F or 7.5F
- Injectate volume range: 3, 5, 10 cc
- Cardiac output display

CO value display update cycle:	Every measurement
Thermodilution curve display time:	45 s

- Alarm limits

CO:	None
Blood temperature:	15 to 45°C in 0.1°C steps, OFF

Respiration (Thermistor probe pneumography)

- Respiration rate counting range: 0 to 150 resp/min
  Apnea, 5 to 40 s
- Accuracy: ±1 resp/min
- Temperature measuring range: 10 to 40°C (50 to 104°F)
- Maximum detection resistance range: 1 kΩ
- Recorder sensitivity: Δ100 Ω/400 digits ±10%
  (400 digits is equivalent to 1 cm on paper at ×1 recorder sensitivity)
- Noise: ≤1.0 Ω (referred to input)
- Frequency response: 0.1 to 3 Hz (Digital filter processing)
- Waveform display

Display sensitivity:	10 mm/100 Ω (at ×1 sensitivity)
Sensitivity control:	×1/4, ×1/2, ×1, ×2, ×4 or AUTO

- Respiration rate display update cycle: Every 3 s or when alarm is generated
- Alarm

Upper limit range:	2 to 150 breaths/min in 2 breaths/min steps, OFF
Lower limit range:	OFF, 0 to 148 breaths/min in 2 breaths/min steps
Apnea time:	5 to 40 s in 5 s steps, OFF

Inspired Oxygen Fractional Concentration, FiO_2

- Measuring range: 10 to 100% O_2 in 1% steps
- Amplifier accuracy: ±1% full scale
- Accuracy including sensor

21% O_2 calibration:	±3% full scale
100% O_2 calibration:	±2% full scale

- Noise: ≤ 0.12% O_2
- Temperature drift: ±0.12% O_2/°C
- FiO_2 display update cycle: Every 3 s or when alarm is generated
- Alarm

Lower limit range:	OFF, 18 to 100% in 1% steps, OFF

Expired Carbon Dioxide Tension, CO_2

- Measurement method: Main stream method
- Measuring range: 0 to 76 mmHg
- Warm-up time: Main stream method: none
- Response time: 200 ms (typ.) for step from 10 to 90%

- Detectable respiration rate: Main stream: 3 to 60 breaths/min
- Measuring accuracy (When 1 atmospheric pressure, air inspiration, non condensation)

  0 to 40 mmHg: ±4 mmHg
  41 to 76 mmHg: ±10% reading
  O_2 gas effects: Approx. −10% reading (When 100% oxygen is inspired)
  CO_2 gas, N_2O anesthetic gas effects: Effects when 1 mmHg CO_2 gas is inspired, approx. 10% reading
  Accuracy in using N_2O anesthetic gas is not guaranteed
- CO_2 value display update cycle: Every 3 s or when alarm is generated
- Alarm

  $EtCO_2$ upper limit range: 2 to 99 mmHg in 1 mmHg steps, OFF
  $EtCO_2$ lower limit range: OFF, 1 to 98 mmHg in 1 mmHg steps, OFF
  Apnea time: 5 to 40 s in 5 s steps, OFF

ECG/BP Output

- Output impedance

  ECG: 100 Ω
  BP: 100 Ω
- Output waveform

  ECG: ≥ ±4.096 V (at 1 mV/V)
  BP: −0.64 to +4.48 V (at 100 mmHg/V)
  HT: Open collector output (Maximum sink current 3 mA, pulse width 100 ms)
- Frequency response

  ECG: DC to ≥35 Hz
  BP: DC to ≥15 Hz
- Sensitivity accuracy

  ECG: ±5%
  BP: ±1%
- Delay

  ECG: ≤ 35 ms
  BP: ≤ 35 ms
  HT: ≤ 100 ms

Multi Parameter Module, AY-910PA

Same as AY-900PA Multi Parameter Module, except for SpO_2.

SpO_2 and Pulse Wave (Arterial Plethysmographic Waveform)

With Nellcor probe

- Measuring range

  SpO_2: 1 to 100% SpO_2 in 1% SpO_2 steps
  Pulse rate: 20 to 250 beats/min
- SpO_2 accuracy

  70 to 100% SpO_2: ±2% SpO_2

- SpO_2 display

Display update cycle:	Every 3 s or when alarm is generated
Sync tone modulation:	Changes in 20 steps at 81 to 100%

- Alarm

Upper limit range:	OFF, 51 to 100% in 1% steps
Lower limit range:	OFF, 50 to 99% in 1% steps

Recorder Module, WS-920PA

- Recorder

Recording method:	Thermal array recording
Number of channels:	2 channels (maximum)
Maximum recording width:	≥ 45 mm
Paper speed:	5, 25 or 50 mm/s, ±2%
Recording paper:	FQW50-3-100

Power Requirement

Line voltage:	MU-950RJ: AC 100 to 127 V ±10%
	MU-950RK: AC 220 to 240 V ±10%
Line frequency:	50 or 60 Hz
Power consumption:	120 VA maximum, including the color display unit

Environment for All Units and Modules

- Operating environment

Temperature:	10 to 40°C (50 to 104°F) excluding recording paper
Humidity:	30 to 90% RH (0 to 40°C, 32 to 104°F non-condensing)
Atmospheric pressure:	70 to 106 kPa

- Storage environment

Temperature:	–20 to 65°C (–4 to 149°F) excluding recording paper
	Recording paper: –15 to 55°C (5 to 131°F)
Humidity:	15 to 90% RH (non-condensing)
Atmospheric pressure:	70 to 106 kPa

Dimensions and Weight (Approximate)

MU-950RJ/RK Main Unit:	345 W × 300 H × 205 D, 6.5 kg
AY-900PA/910PA Multi Parameter Module:	
	113 W × 117 H × 160 D, 1.5 kg
AA-900PA Smart Module:	37 W × 117 H × 160 D, 0.4 kg
RY-002PA Remote Control:	50 W × 22 H × 162 D, 0.09kg
WS-920PA Recorder Module:	113 W × 117 H × 160 D, 0.9 kg
EK-900P Blank Module:	37 W × 117 H × 160 D, 0.17 kg

Electromagnetic Compatibility

IEC 60601-1-2 (1993)

Safety Standard

Safety Standard: IEC 60601-1 (1988)
IEC 60601-1 (1991) Amendment 1
IEC 60601-1 (1995) Amendment 2
IEC 60601-1-1 (1992)
IEC 60601-1-1 (1995) Amendment 1
IEC 60601-2-27 (1994) Particular requirements for the safety of electrocardiographic monitoring
IEC 60601-2-30 (1995) Particular requirements for the safety of automatic cycling in direct blood pressure monitoring equipment
IEC 60601-2-34 (1994) Particular requirements for the safety of direct blood pressure monitoring equipment

According to the type of protection against electrical shock:
CLASS I EQUIPMENT

According to the degree of protection against electrical shock:
AY-900PA/910PA: Defibrillator-proof type CF applied part: ECG, Resp (impedance), SpO_2, NIBP, IBP, Temp, Resp (thermistor), FiO_2
CF applied part: CO
BF applied part: CO_2 (main stream)
AA-900PA: Defibrillator-proof type CF applied part: IBP, Temp, Resp (thermistor), FiO_2
CF applied part: CO
BF applied part: CO_2 (main stream)

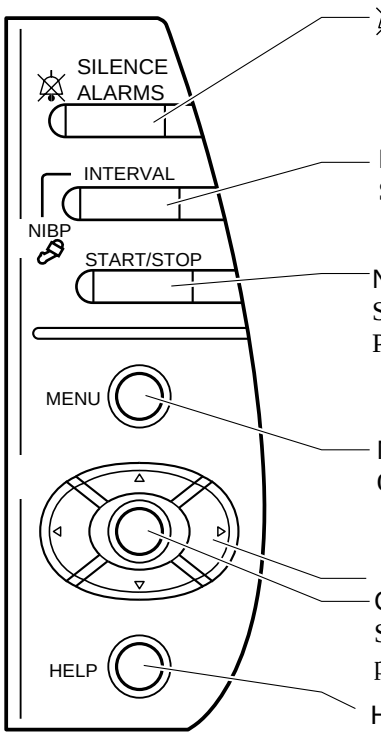
According to the degree of protection against harmful ingress of water:
IPX0 (Ordinary EQUIPMENT)

According to the degree of safety of application in the presence of a FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR OXYGEN OR NITROUS OXIDE:
EQUIPMENT not suitable for use in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE

According to the mode of operation:
CONTINUOUS OPERATION

Panel Description

Control Panel



SILENCE ALARMS key
Silences the alarm sound.

NIBP INTERVAL key
Selects NIBP measurement mode. Pressing this key changes the mode.

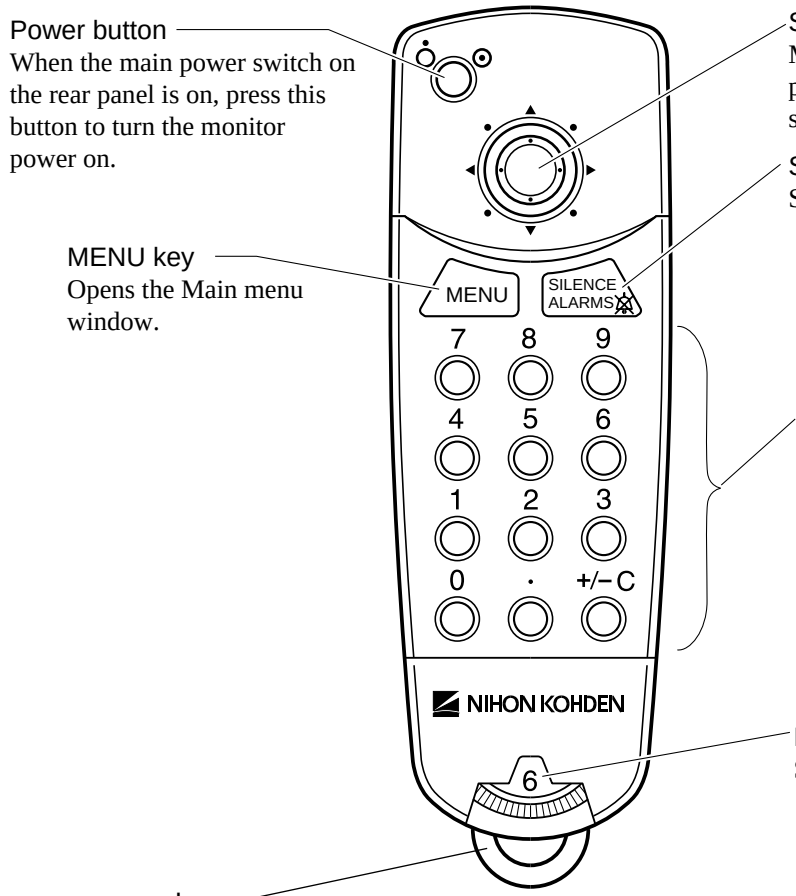
NIBP START/STOP key
Starts NIBP measurement in the selected mode.
Pressing the key during measurement stops measurement.

MENU key
Opens the Main menu window.

△,▽, ◁,▷ keys
Center key
Selects the items and menus on the screen and performs various operations.

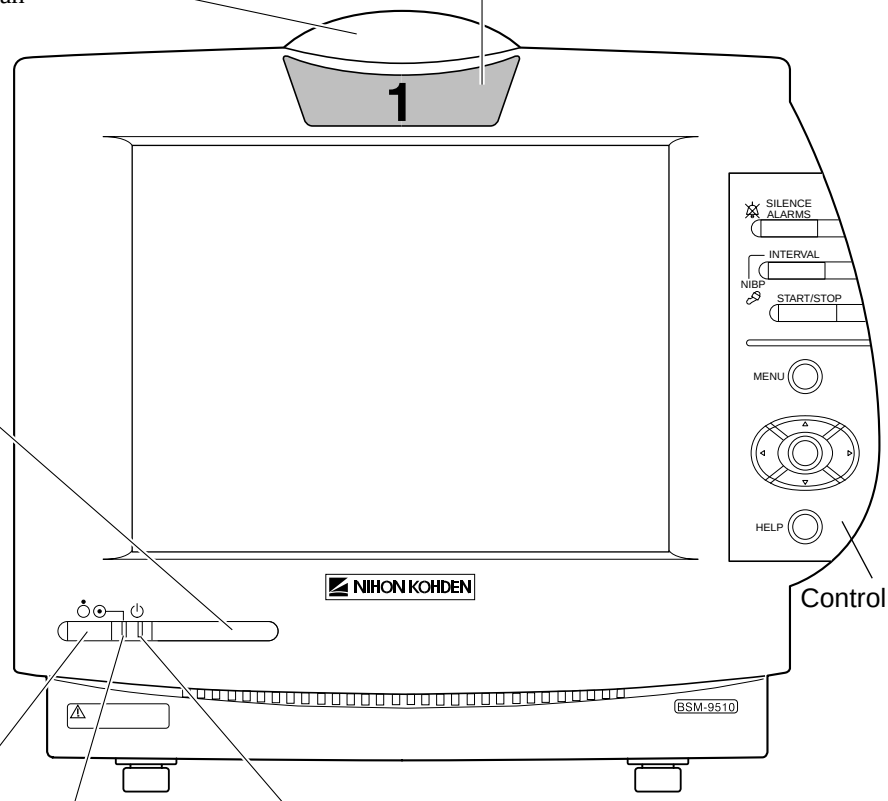
HELP key
Displays help on the screen.
Not available in this version.

Remote Control


Power button
When the main power switch on the rear panel is on, press this button to turn the monitor power on.
Selection knob
Move this knob up/down/left/right and press to select items and menus on the screen.
SILENCE ALARMS key
Silences the alarm sound.
MENU key
Opens the Main menu window.
MENU
SILENCE ALARMS
7 8 9
4 5 6
1 2 3
0 · +/− C
Numerical keys
For entering numbers and performing shortcut key operations.
NIHON KOHDEN
Monitor selection dial
Selects the monitor.
6
Loop
Attach a string or strap to hang the remote control.

Main Unit

Front Panel



Alarm indicator
Blinks or lights when an alarm is activated.

Remote control channel label
Corresponds to the monitor selection dial on the remote control.

Remote control sensor
Receives signal from the remote control.
Always keep it clean.

Control panel

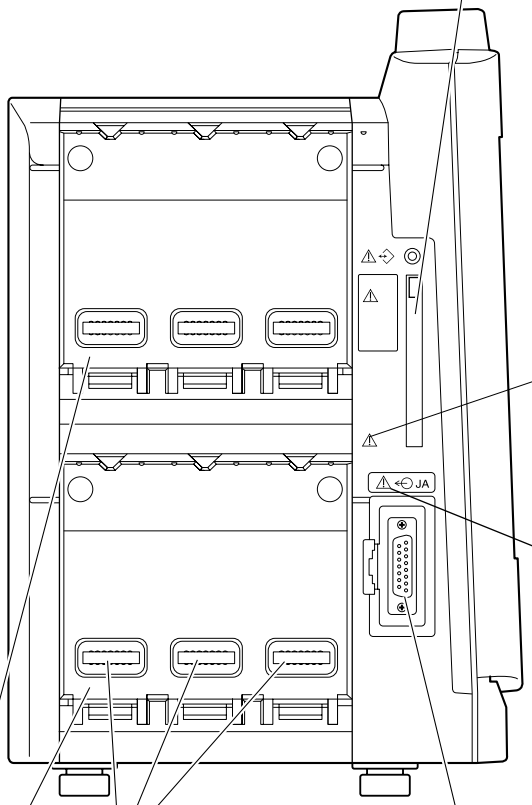
Front power switch
When the main power switch on the rear panel is on, press this switch to turn the monitor power on.

⚠
Press and hold the front power switch for more than 1 second to turn the power off.

Power lamp
Lights when the main power switch on the rear panel and the front power switch on the front panel are on.

Main power lamp
Lights when the main power switch on the rear panel is on.

Left Side Panel



Memory card slot
For a memory card for upgrading the monitor software.

⚠

Do not eject the memory card or turn off the monitor while the memory card lamp is lit. This may damage the memory card and stored data.
Only use the specified memory card.

⚠

Only use the AY-900PA/910PA multi parameter module, AA-900PA smart module, AG-900PA CO_2 module, WA-920PA recorder module and EK-900P blank module.

⚠

Refer to the cautions in "Connecting the System" in Section 3.

Module connectors
Connect to the sockets on the module.

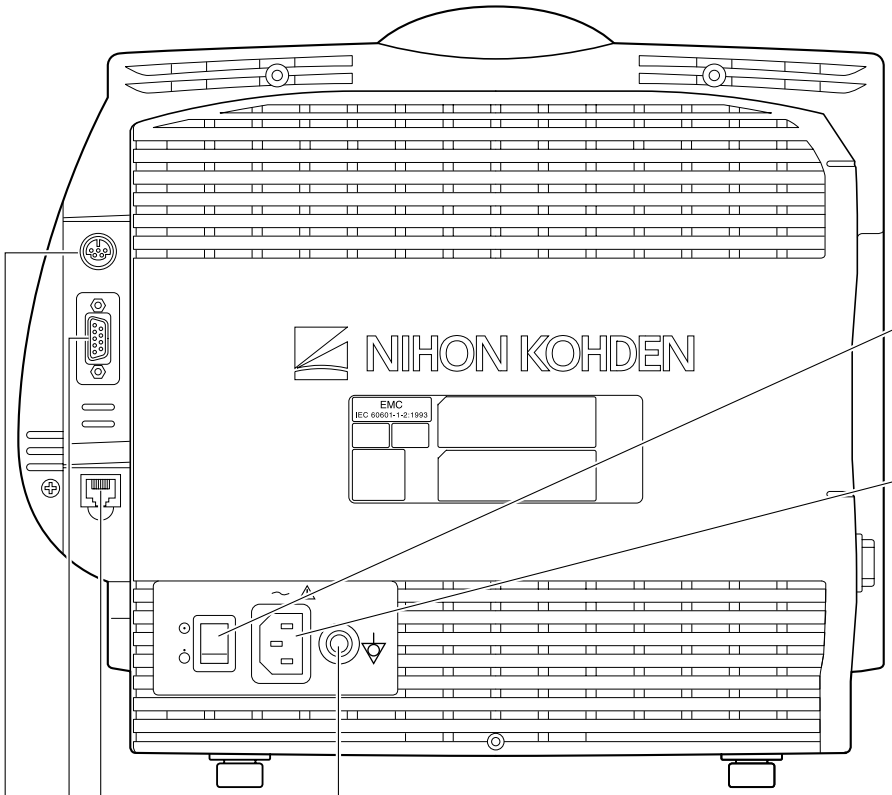
CAUTION
Do not open the connectors. Otherwise you may receive electrical current or the monitor may be damaged.

JA output socket (⟲)
Connects to an input box or unit using the JA connection cable.
Not available in this version.

NOTE
Cover the socket when not in use to prevent dust from getting inside the monitor.

Slots
For the modules.
Insert EK-900P blank modules in empty slots to prevent dust from accumulating on the connectors.

Rear Panel



Main power switch
Turns the main power on or off.

Power socket
Connects to a wall outlet using the power cord to supply AC to the monitor.

⚠

Refer to the cautions in "Connecting the Power Cord and Grounding the Monitor" in Section 3.

Equipotential terminal
Connects to the equipotential ground cable.

NETWORK socket
Connects to the 10 BASE-T cable of the network.
Not available in this version.

SERIAL socket
Connects to a PC.
Not available in this version.

ALARM socket
Connects to the optional alarm pole.

⚠

NOTE

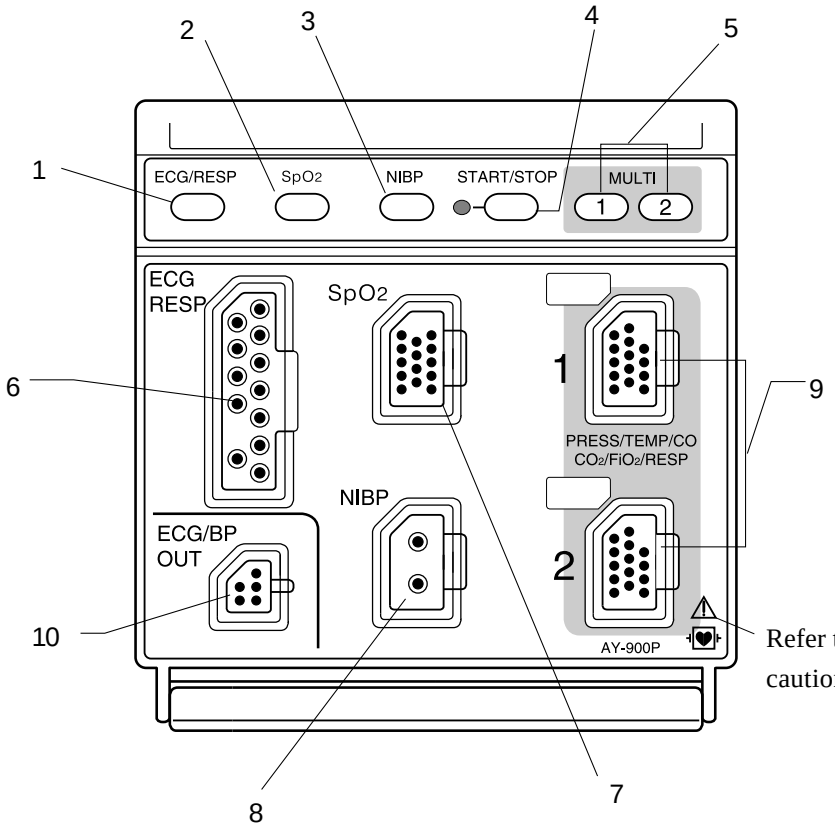
Do not touch the NETWORK socket when you have static electricity on your hand.
Cover the NETWORK socket when not in use.

Multi Parameter Module

AY-900PA is for Nihon Kohden SpO_2 probes.
AY-910PA is for Nellcor SpO_2 probes.

CAUTION

When pressing the keys on the module, use your finger. Do not press the keys with a sharp object. Otherwise keys may be broken.



Refer to the warning and cautions on the next page.

No.	Name	Description
1	ECG/RESP key	Press to open the ECG window.
2	SpO_2 key	Press to open the SpO_2 window.
3	NIBP key	Press to open the NIBP window and change the NIBP measurement mode.
4	START/STOP key	Measures the NIBP in the selected mode. Pressing again during measurement stops measurement.
5	MULTI 1, MULTI 2 keys	Press to open the windows of the parameters connected to the MULTI 1 or MULTI 2 socket.
6	ECG RESP socket	Connects to the ECG connection cord.
7	SpO_2 socket	Connects to the SpO_2 connection cord.
8	NIBP socket	Connects to the air hose.
9	MULTI 1, MULTI 2 sockets	Connects to the connection cord of the parameter to be measured (IBP, temperature, CO, CO_2, FiO_2 or respiration by thermistor method). The type of parameter is automatically recognized. When using the BP output signal, use the MULTI 1 socket.
10	ECG/BP OUT socket	Outputs 100 mmHg/V IBP waveform of the pressure connected to the MULTI 1 socket, 1 mV/V ECG waveform of the first trace and heart rate trigger. Refer to the below warning.

Using the Output Signal from the ECG/BP OUT Socket

WARNING

When using the output signal from the module as the synchronization signal for other equipment such as IABP (intra-aortic balloon pump) or defibrillator:

- **Set the timing of the other equipment by checking the waveform on the monitoring screen.**
- **Check the condition of the bedside monitor at all times. The output signal may become unstable.**
- **The hum filter is always set to on for the ECG output. ECG output differs from the ECG on the monitor screen regardless of the filter setting.**
- **Check that the delay time of the output signal (heart rate trigger 100 ms maximum) is within the range of the connected equipment. Refer to Section 11 of the operator's manual.**
- **Do not use the heart rate trigger as the synchronization signal for defibrillator.**

NOTE

The output signal from the ECG/BP OUT socket may become unstable in the following conditions.

- **Electrode is dry or detached.**
- **Electrode lead is damaged or disconnected from the electrode.**
- **Electrode lead is pulled.**
- **AC interference or EMG noise superimposed.**
- **Air bubbles or blood clog in the circuit for monitoring IBP.**
- **Any cord or cable disconnected or damaged.**

Using MULTI Sockets for CO and CO_2 Monitoring

WARNING

- **When performing defibrillation during CO monitoring, never touch the CO connection cord. Otherwise the discharged energy may cause serious electrical burn, shock or other injury.**
- **When performing defibrillation during CO_2 monitoring with the TG-900P CO_2 sensor kit, remove the sensor from the patient. When the sensor cannot be removed, do not touch the sensor cable because the discharged energy may cause serious electrical burn, shock or other injury.**

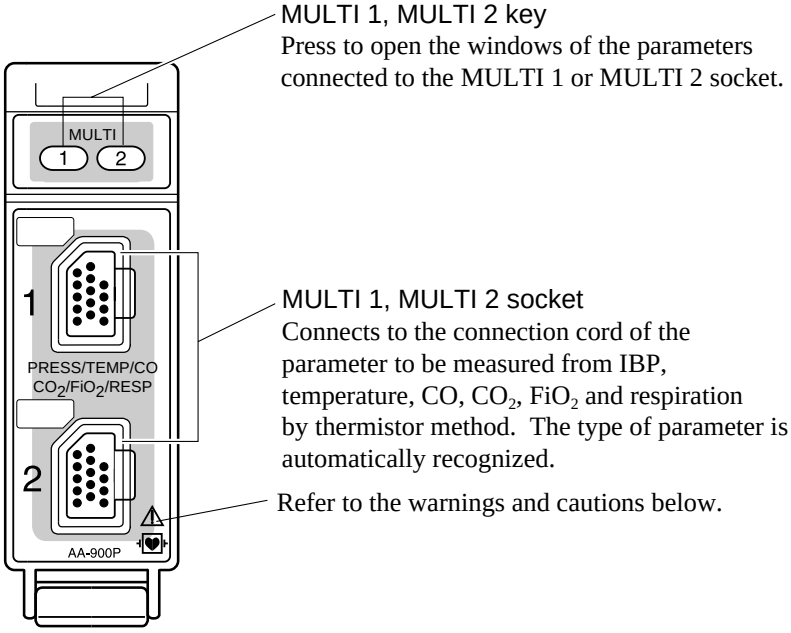
NOTE

- **CO monitoring using the MULTI socket does not comply with the Defibrillator proof type CF.**
- **CO_2 monitoring using the MULTI socket does not comply with the Defibrillator proof type BF.**

Smart Module

CAUTION

When pressing the keys on the module, use your finger. Do not press the keys with a sharp object. Otherwise keys may be broken.


MULTI 1, MULTI 2 key
Press to open the windows of the parameters connected to the MULTI 1 or MULTI 2 socket.
MULTI
1
2
1
PRESS/TEMP/CO
CO2/FiO2/RESP
2
AA-900P
MULTI 1, MULTI 2 socket
Connects to the connection cord of the parameter to be measured from IBP, temperature, CO, CO2, FiO2 and respiration by thermistor method. The type of parameter is automatically recognized.
Refer to the warnings and cautions below.

Using MULTI Sockets for CO and CO_2 Monitoring

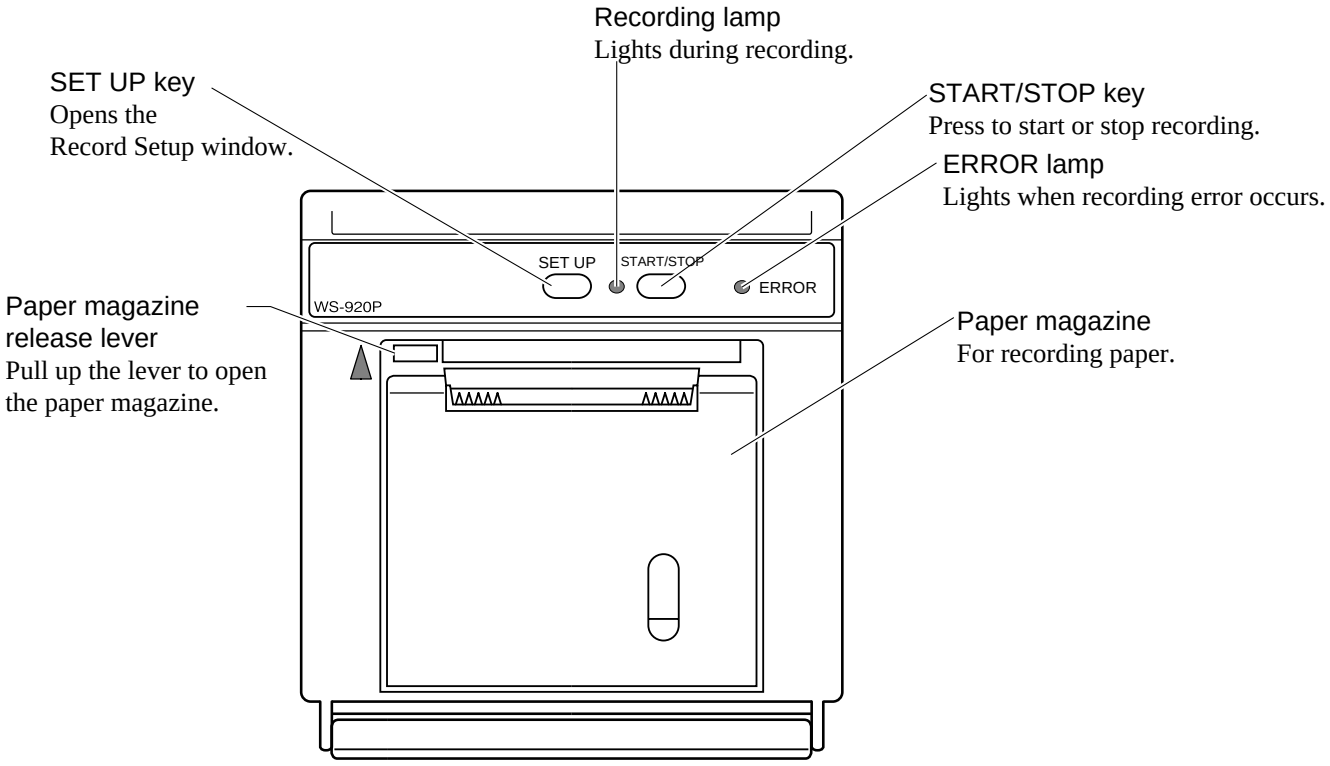
WARNING

- **When performing defibrillation during CO monitoring, never touch the CO connection cord. Otherwise the discharged energy may cause serious electrical burn, shock or other injury.**
- **When performing defibrillation during CO_2 monitoring with the TG-900P CO_2 sensor kit, remove the sensor from the patient. When the sensor cannot be removed, do not touch the sensor cable because the discharged energy may cause serious electrical burn, shock or other injury.**

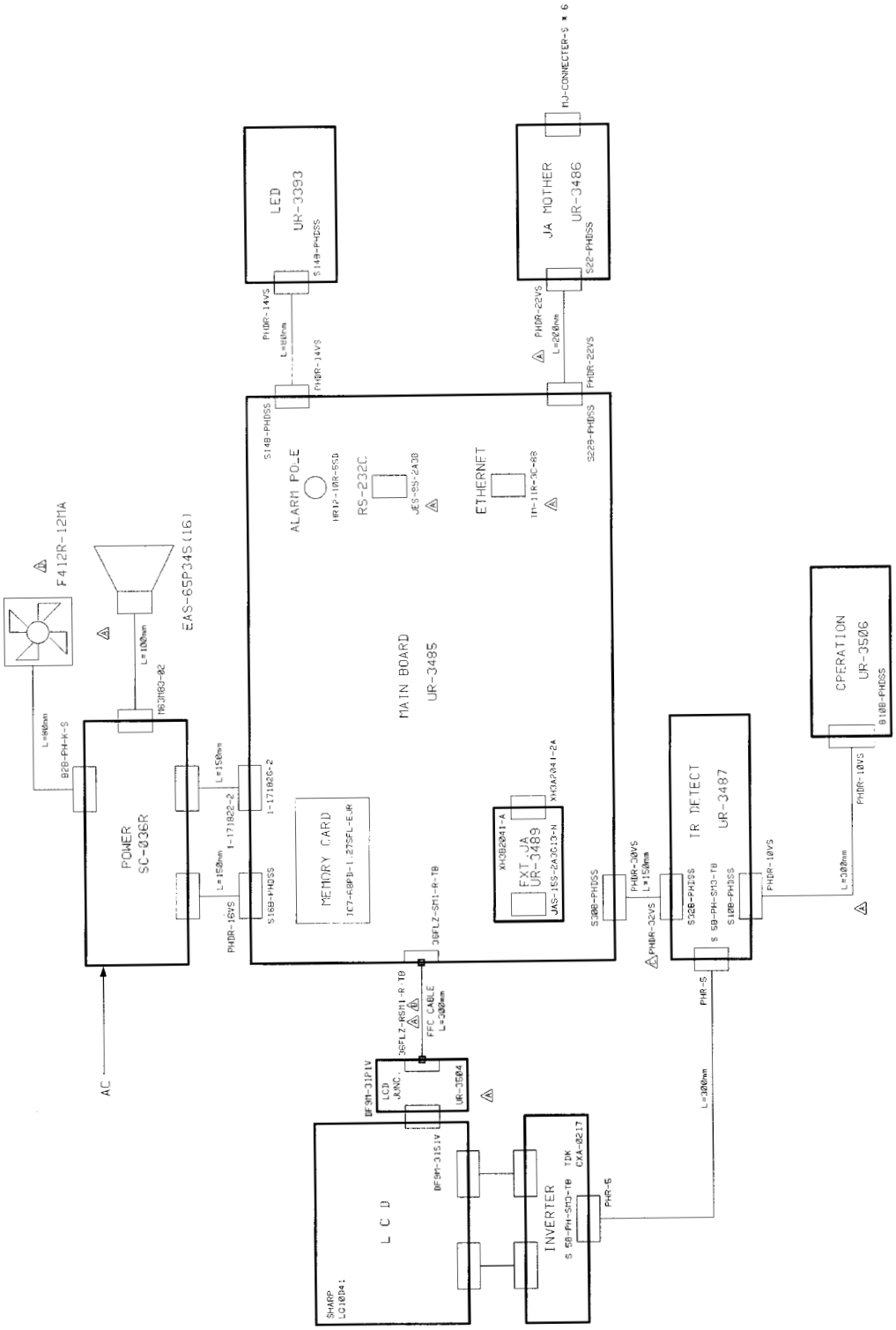
NOTE

- **CO monitoring using the MULTI socket does not comply with the Defibrillator proof type CF.**
- **CO_2 monitoring using the MULTI socket does not comply with the Defibrillator proof type BF.**

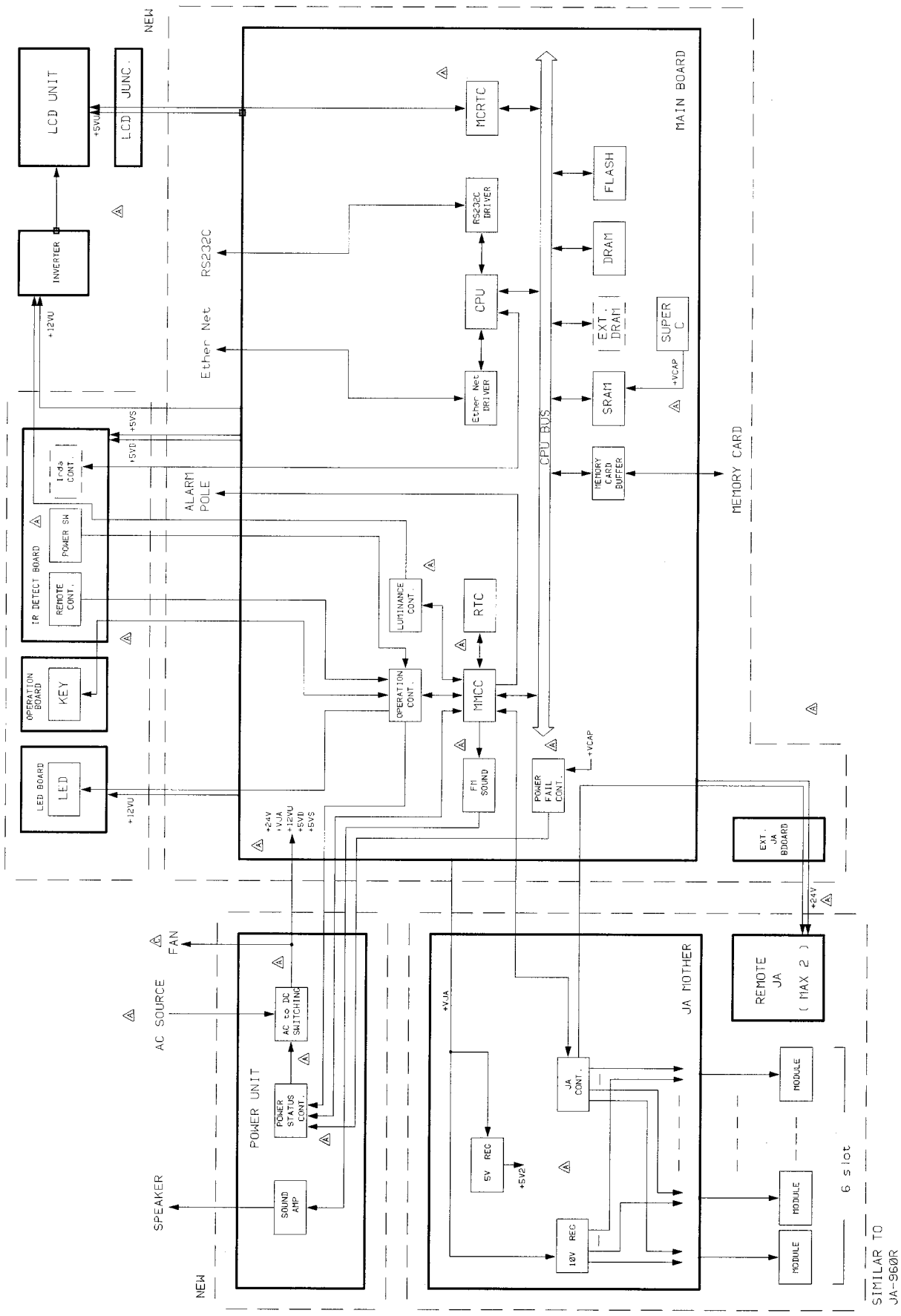
Recorder Module



Connection Diagram



Block Diagram



Section 2 Troubleshooting

Troubleshooting Table 2.1
How to Use the Troubleshooting Table 2.1
Power-Related Problem 2.2
Display Problems 2.2
Sound Problem 2.2
Key Operation Problems 2.3
Recorder Problem 2.3
Other Module-Related Problem 2.3

Troubleshooting Table

Use the troubleshooting table to locate, identify and solve a problem in the instrument. The problems are divided into general problem areas. Each category has its own troubleshooting table for fast and easy troubleshooting.

- Power-Related Problems
- Display Problems
- Sound Problems
- Key Operation Problems
- Recorder Problems
- Other Module-Related Problems

Refer to Section 21 “Maintenance” in the operator’s manual.

How to Use the Troubleshooting Table

1. Determine which troubleshooting table to use.
2. In the “Problem” column, find the trouble item that matches the problem.
3. Do the action recommended in the “Action” column.
4. If the problem is not solved, do the action for the next possible cause or criteria.
5. If none of the actions solve the problem, contact your Nihon Kohden representative.

Power-Related Problem

Problem	Possible Cause/Criteria		Action
The power of the main unit does not turn on.	The AC power switch on the rear panel is set to off.		Set the AC power switch to on.
	When the standby lamp does not light even if the AC power switch is set to on.	No AC power input.	Check the AC power input.
		Faulty power cord.	Replace the power cord.
		One or both of the AC inlet fuses are blown.	Determine and correct the cause of the blown fuse, then replace the fuse.
		Faulty power supply unit.	Replace the power supply unit.
	It happens after the main unit is assembled.	Poor internal connection.	Check the continuity of cables and boards.

Display Problems

Problem	Possible Cause/Criteria		Action
No display.	NIBP START/STOP key on the control panel is operational with AY-900PA/910PA.	Faulty LCD unit.	Replace the LCD unit.
		Faulty DC-AC inverter.	Replace the DC-AC inverter.
		Faulty MAIN board.	Replace the MAIN board.
	The power lamp does not light.	Faulty MAIN board.	Replace the MAIN board.
The screen is distorted or partially abnormal.	The same part* of the LCD has an abnormal on any screen.	Faulty LCD unit.	Replace the LCD unit.
	The LCD unit has an abnormal on specified Display Check screens.	Faulty MAIN board	Replace the MAIN board.
Diagnostic Check and System Setup screen is displayed.	The error message is shown at the Power ON Check Result on the screen.		Replace the board considered faulty with the error message.
System error is displayed.	Faulty MAIN board.		Replace the MAIN board.

* For TFT LCD screen, it is considered normal if some pixels have abnormal color or do not light.

Sound Problem

Problem	Possible Cause/Criteria	Action
No sound.	Poor contact between the speaker and power supply unit.	Check the continuity of the connection cable and socket at the power supply unit.
	Faulty power supply unit.	Replace the power supply unit.
	Faulty MAIN board.	Replace the MAIN board.

Key Operation Problems

Problem	Possible Cause/Criteria		Action
No key operation.	Any key is not operational.	Poor internal connection.	Check the continuity of the cables and boards in between.
		Faulty OPERATION board.	Replace the OPERATION board.
		Faulty MAIN board.	Replace the MAIN board.
	Specified key is not operational.	The key on the IR DETECT board.	Replace the IR DETECT board.
		The key on the MAIN board.	Replace the MAIN board.
No remote control operation.	Any key is not operational.	Remote control channel is set to a specified cahnnel.	Confirm which channel is set on the Setup Menu window.
		The two batteries are weak.	Replace the two batteries.
		Faulty IR DETECT board.	Replace the IR DETECT board.
		Faulty remote control.	Replace the remote control.
	Specified key is not operational.	Faulty key switch on the remote control.	Replace the remote control.

Recorder Problem

Problem	Possible Cause/Criteria		Action
No operation of the recorder module.	There is an error at JA I/F Check.	Faulty JA motherboard.	Replace the JA motherboard.
		Faulty MAIN board.	Replace the MAIN board.
	There is no error at JA I/F Check.	Poor insertion of the recorder module.	Completely insert the recorder moule into the slot.
		Faulty recorder module.	Replace the recorder module.

Other Module-Related Problem

Problem	Possible Cause/Criteria		Action
No waveform display.	Any waveform is not displayed on the screen.	Faulty JA motherboard.	Replace the JA motherboard.
	Waveform of the specified parameter is not displayed.	Breaking of the input cable or faulty connector, sensor, transducer.	Replace the corresponding cable.
		Faulty module.	Replace the module.
		Faulty slot.	Replace the JA motherboard.

Section 3 Diagnostic Check

Introduction 3.1
Power On Self Check 3.2
Calling up the Diagnostic Check and System Setup Screen 3.3
MU Manual Check 3.5
- Memory Check 3.5
  - Flash ROM (program) Check 3.6
  - Flash ROM (data) Check 3.6
  - SRAM Check 3.6
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- Com Check 3.7
  - Network I/F Check 3.8
  - Serial I/F Check 3.10
  - JA I/F Check 3.10
- Display Check 3.13
  - Frame Mem Check 3.13
  - Graphic Check 3.14
  - Waveform Check 3.14
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- Key LED Check 3.15
  - Key Check 3.15
  - Remote Check 3.16
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  - Alarm Pole Check 3.17
- Other Check 3.17
  - Sound Check 3.18
  - Power Check 3.18
  - Card I/F Check 3.18
  - Timer IC Check 3.19

Introduction

The instrument has an automatic power on self check as well as a complete set of diagnostic checks that you can perform at any time.

All errors detected during the power on self check, diagnostic checks, and any time during operation are stored in the error history table.

The diagnostic checks, error history, system setup, and initialization are accessed from the Diagnostic Check and System Setup screen.

In this section, functions which are displayed on the screen are indicated by brackets, for example, the [Monitor Mode] function on the Diagnostic Check and System Setup screen.

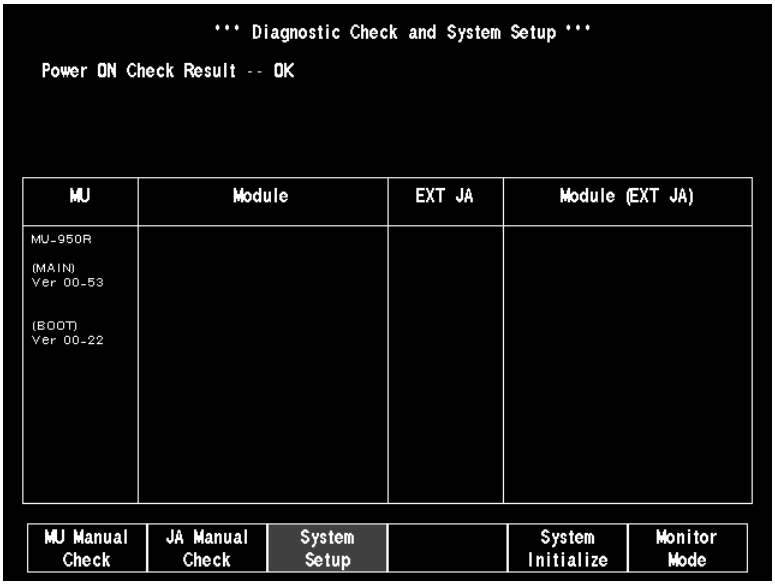
Power On Self Check

This self check is performed every time the power switch on the front panel is turned on. "Check Program Running" message appears during the power on self check. If no error is detected, the normal operating mode begins and the patient monitoring display appears. If an error is detected, the screen displays one of the following items according to the check items.

Check Item	How to Check	Action at Error Occurrence
Flash ROM Check for system program	The sum of the stored data from the beginning address to the last second address is compared with the prestored check sum at the last address.	The check is interrupted. An error message is displayed.
DRAM Check	The test patterns written to the DRAM are compared with the test patterns which were read out from the DRAM.	The check is interrupted. An error is displayed.
Flash ROM Check for Setting Conditions	The data which is read out from the flash ROM is compared with the fixed data.	The flash ROM is initialized and its message is displayed. Next check item follows.
JA RAM Check	The test patterns written on the JA RAM are compared with the test patterns which were read out from the JA RAM.	An error message is displayed. Next check item follows. After the power on self check, the Diagnostic Check and System Setup screen appears.
SRAM Backup Check	The data read out from the SRAM is compared with the previous data which was written on the SRAM.	The SRAM is initialized and its message is displayed. Next check item follows.
Timer IC Memory Backup Check	The data read out from the real time clock IC built-in memory is checked.	The real time clock IC built-in memory is initialized and its message is displayed. Next check item follows.

Calling up the Diagnostic Check and System Setup Screen

1. With the power off, press the power switch on the front panel while pressing the SILENCE ALARMS key on the control panel. Continue pressing the SILENCE ALARMS key until the Diagnostic Check and System Setup screen appears.



Power ON Check Result: When no error is found during the power on self check, OK is displayed. If an error is found during the power on self check, ERROR and the check item at which the error is found are displayed.

MU: Shows model number of the main unit, system program version, and boot program version

Module: Shows model numbers and software versions of the modules inserted into the slots of the main unit.

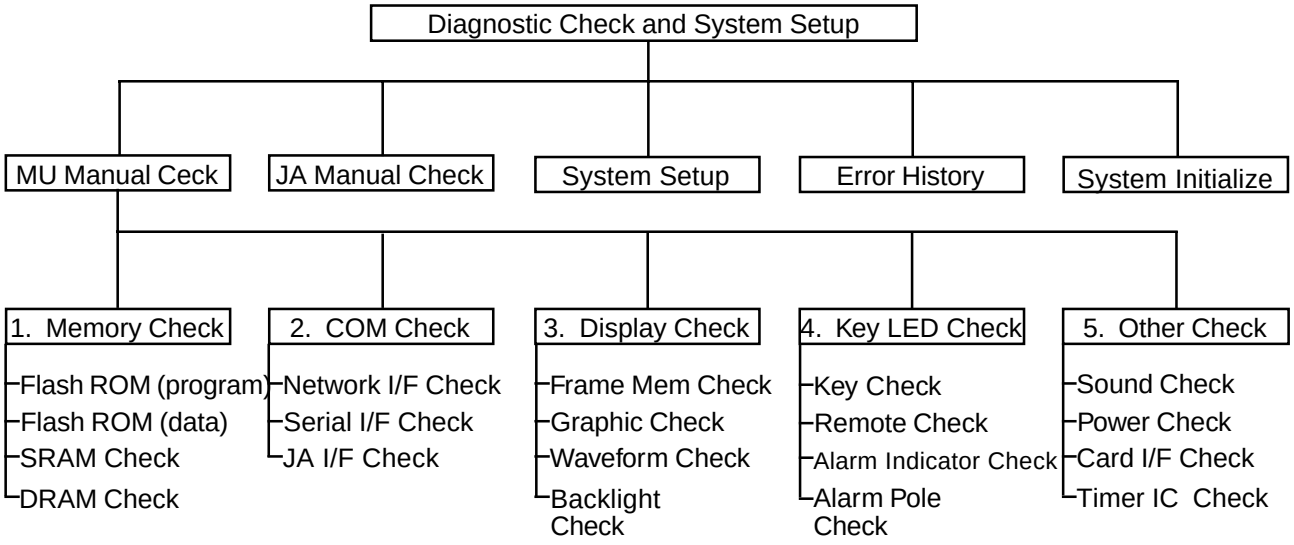
EXT JA: Shows description of the optional unit connected to the EXT JA socket.

Module (EXT JA): Shows model number and software version of any optional unit connected to the EXT JA socket of the main unit.

While this screen is displayed, the connection check results of Module, EXT JA, Module (EXT JA) are updated in real time.

2. To exit the Diagnostic Check and System Setup screen and return to the patient monitoring mode, select the [Monitor Mode] using the left or right arrow key on the control panel and pressing the center key on the control panel.

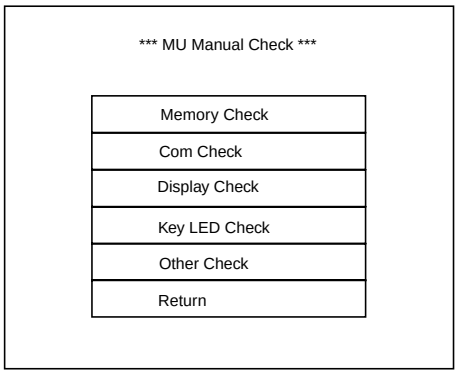
To perform the diagnostic check, system setup, or initialization or to view the error history, select one of the functions at the bottom of the screen using the left or right arrow key on the control panel and pressing the center key on the control panel.



MU Manual Check

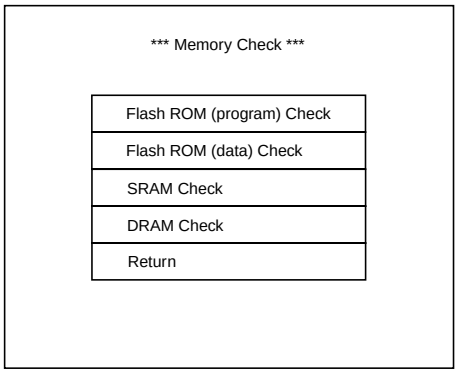
Select [MU Manual Check] using the left or right arrow key on the control panel and pressing the center key on the control panel. The MU Manual Check screen appears.

On the screen, using the up or down arrow key on the control panel and pressing the center key on the control panel allows you to select the various function check screens. To return to the Diagnostic Check and System Setup screen, select [Return].



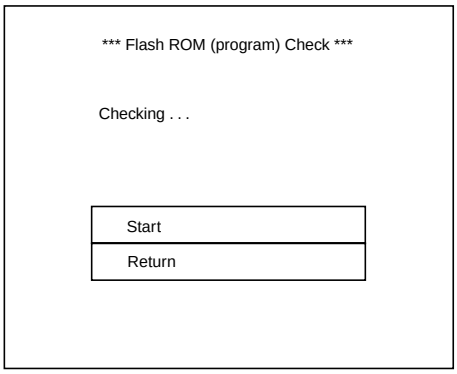
Memory Check

On the MU Manual Check screen, select [Memory Check]. The Memory Check screen, which checks the memory on the MAIN board, appears. On the Memory Check screen, the following checks are available. To return to the MU Manual Check screen, select [Return].



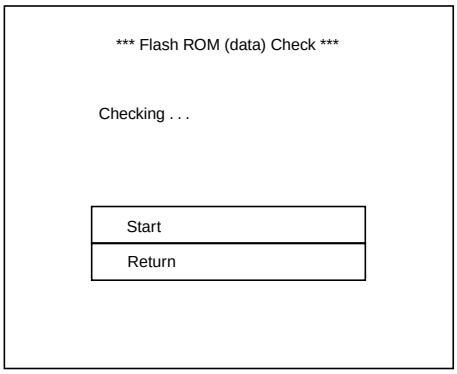
Flash ROM (program) Check

This screen allows you to check if the program stored in the flash memory has an error.
To start the check, select [Start]. "Checking…" message is displayed during the check. After the check, OK or Error appears.
To return to the Memory Check screen, select [Return].



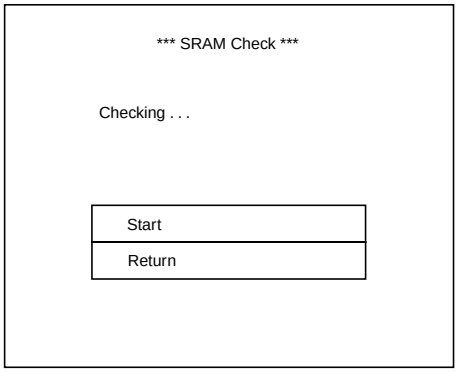
Flash ROM (data) Check

This screen allows you to check if the writable area of the flash memory has an error by writing test data and reading it after deleting the original data.
To start the check, select [Start]. A "Erasing…" message is displayed while the data is being deleted. After the data is deleted, OK appears. A "Checking…" message is displayed during the check. After the check, OK or Error appears.
To return to the Memory Check screen, select [Return].



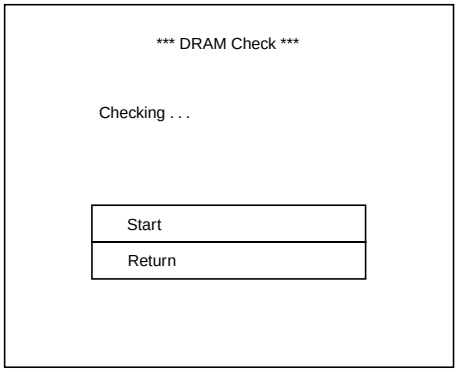
SRAM Check

This screen allows you to check if the SRAM has an error by writing test data and reading it after deleting the original data.
To start the check, select [Start]. A "Checking…" message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the address.
To return to the Memory Check screen, select [Return].



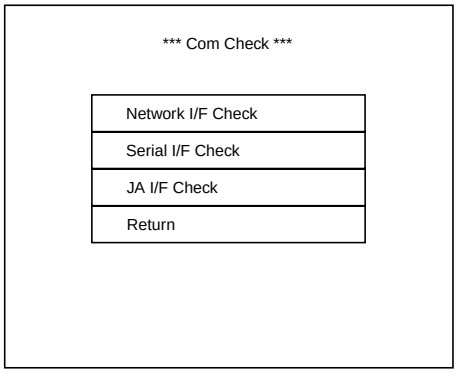
DRAM Check

This screen allows you to check if the DRAM has an error by writing test data and reading it after deleting the original data.
To start the check, select [Start]. A “Checking…” message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the address.
To return to the Memory Check screen, select [Return].



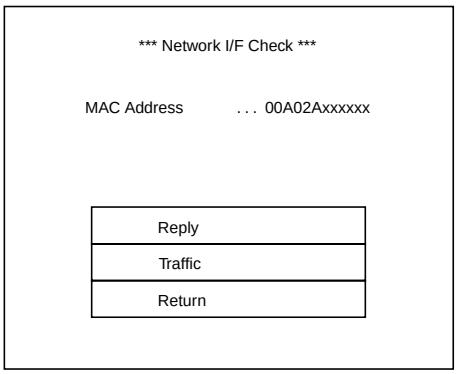
Com Check

On the MU Manual Check screen, select [Com Check]. The Com Check screen, which checks each communication interface on the MAIN board, appears. On the Com Check screen, the following checks are available. To return to the MU Manual Check screen, select [Return].



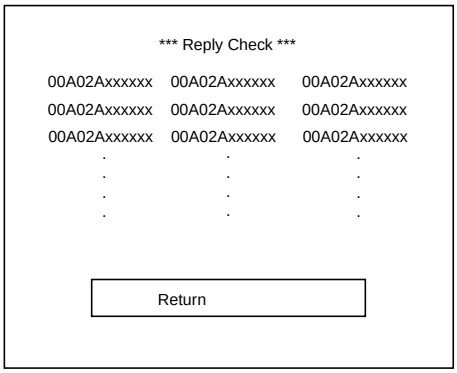
Network I/F Check

This screen allows you to check the network interface, interface loopback, and network connection.



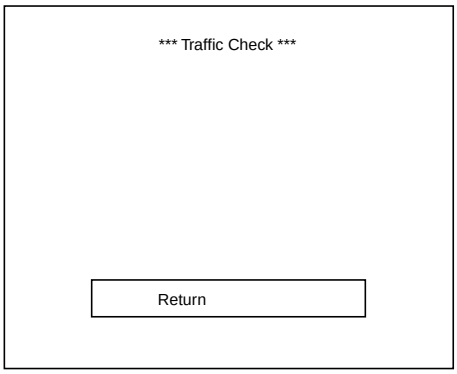
Reply Check

This screen displays the MAC addresses of which the other bedside monitors (up to 48 monitors) in the network transmit the acknowledge signals to this bedside monitor.



Traffic Check

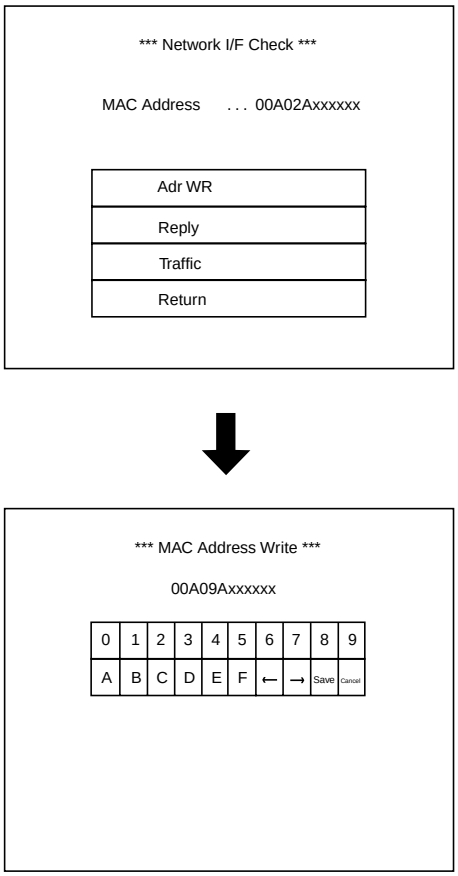
This screen displays the traffic status in the network when test data is uploaded to the network.



MAC Address Write

Since this function is hidden, press the SILENCE ALARMS key on the control panel to display the [Adr WR] in addition to the [Reply] and [Traffic] functions on the Network I/F Check screen. Select the [Adr WR] to display the MAC Address Write screen which allows you to change the MAC address of the bedside monitor. Use the up, down, left, or right arrow key on the control panel to move the cursor to the following items in the table. Press the center key on the control panel to execute the item.

Network I/F Check screen when the SILENCE ALARMS key is pressed


*** Network I/F Check ***
MAC Address . . . 00A02Axxxxxx
Adr WR
Reply
Traffic
Return
*** MAC Address Write ***
00A09Axxxxxx
0 1 2 3 4 5 6 7 8 9
A B C D E F ← → Save Cancel

0 to F: Hexadecimal numbers for input of the MAC address

←, →: Moves the MAC address input position left or right.

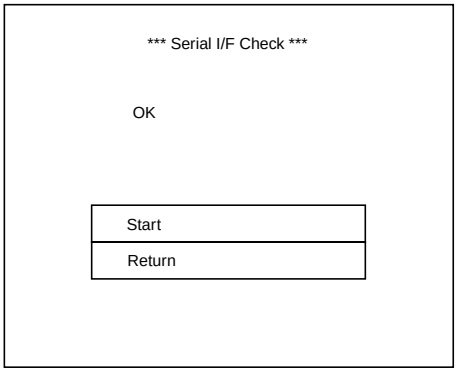
Save: Stores the entered MAC address and returns the screen to the Network I/F Check screen.

Cancel: Leaves the previous MAC address and returns the screen to the Network I/F Check screen.

Serial I/F Check

This screen allows you to perform the loopback test of the serial interface RS-232C under the following conditions by connecting the loopback tester* to the RS-232C port.

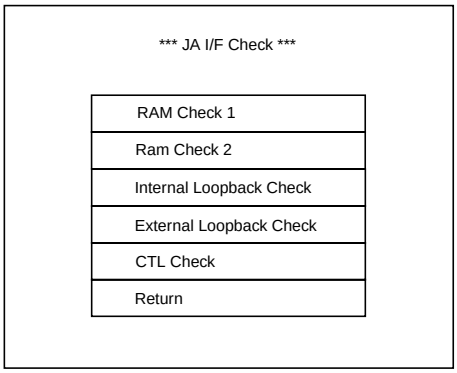
Parity: None
Data length: 8 bits
Stop bit: 1 bit
Baud rate: 9600 bps
* Make the tester locally. Refer to figure xxx.



To start the check, select [Start]. A “Checking…” message is displayed during the check. After the check, OK or Error appears.
To return to the Com Check screen, select [Return].

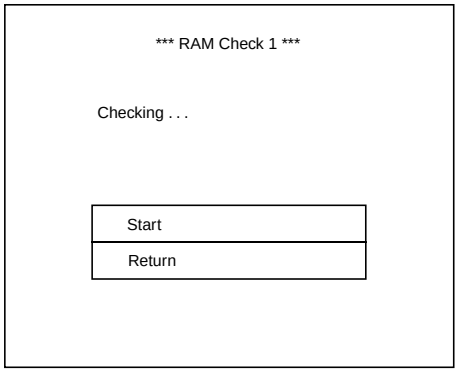
JA I/F Check

This screen allows you to check the communication interfaces for any modules and external units.
The following checks are available.



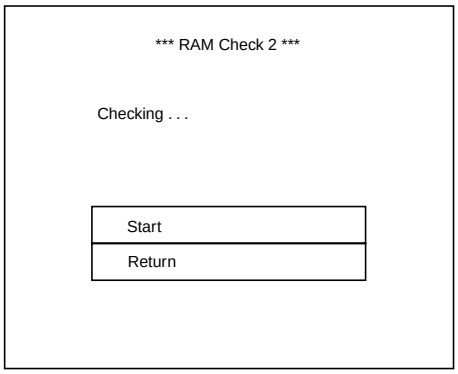
RAM Check 1

This screen allows you to check the RAM, which stores the communication data between the modules and MAIN board, by writing the test data into the RAM and reading the stored data from the RAM. The addresses 0000H to FFFFH (Bank 1) and 0000H to 07FFH (Bank 2) are used for this check.
To start the check, select [Start]. “Checking…” message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the bank and address.
To return to the JA I/F Check screen, select [Return].



RAM Check 2

This screen allows you to check the RAM, which stores the communication data between the modules and MAIN board, by writing the test data into the RAM and reading the stored data from the RAM. The addresses 0000H to 03FFH (Bank A) and 0400H to 07FFH (Bank B) are used for this check.
To start the check, select [Start]. A "Checking…" message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the bank and address.
To return to the JA I/F Check screen, select [Return].

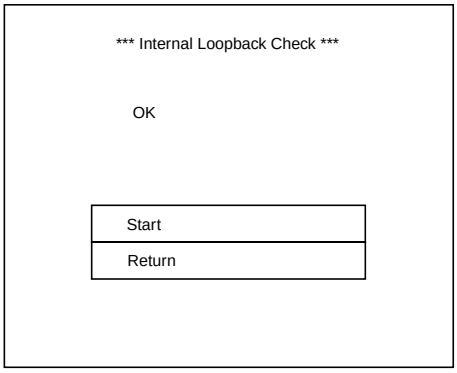


Internal Loopback Check

NOTE

Remove all the modules from the main unit before starting the internal loopback check.

This screen allows you to check the loopback from the JA motherboard by transmitting 512 byte packet (all the data is either zero or one) to the JA motherboard. When all the data is set to one, the source address changes to FEH.
To start the check, select [Start]. A "Checking…" message is displayed during the check. When the data returns to the MAIN board within 5 ms after the data is transmitted to the JA motherboard, OK appears. Otherwise, Error appears.
To return to the JA I/F Check screen, select [Return].

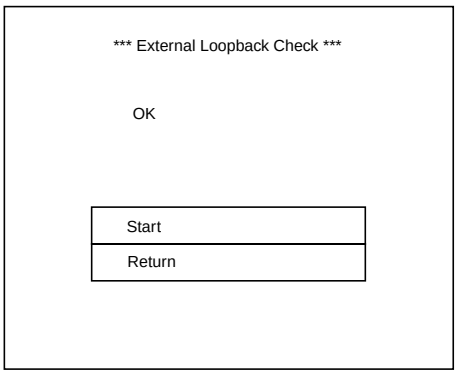


External Loopback Check

NOTE

Connect the Loopback tester to the JA socket of the main unit before starting the external loopback check.

This screen allows you to check the loopback from the EXT JA board by transmitting a 512 byte packet (all the data is either zero or one) to the EXT JA board. When all the data is set to one, the source address changes to FEH.
To start the check, select [Start]. A "Checking…" message is displayed during the check. When the data returns to the MAIN board within 5 ms after the data is transmitted to the EXT JA board, OK appears. Otherwise, Error appears.
To return to the JA I/F Check screen, select [Return].

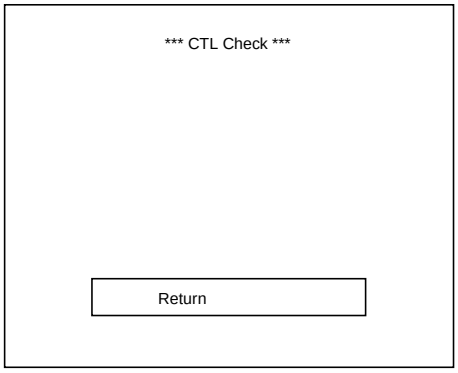


CTL Check

NOTE

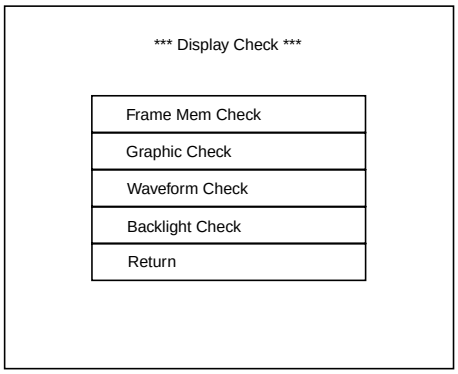
Connect the loopback tester to the JA socket of the main unit before starting the CTL check.

This screen allows you to check the control signal by transmitting it to the EXT JA board every 16 ms.
To return to the JA I/F Check screen, select [Return].



Display Check

On the MU Manual Check screen, select [Display Check]. The Display Check screen, which checks the LCD functions, appears. On the Display Check screen, the following checks are available. To return to the MU Manual Check screen, select [Return].

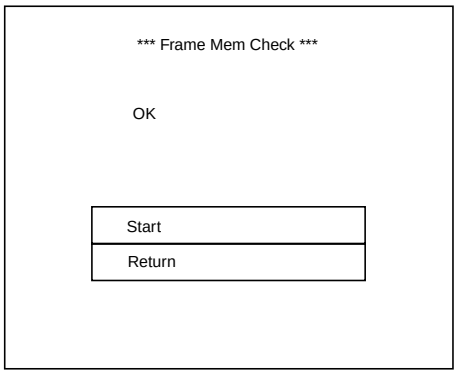


Frame Mem Check

This screen allows you to check the graphic frame memory (character generation area included) and waveform frame memory (waveform data buffer included) by writing the test data into the memories and reading the stored data from the memories.

To start the check, select [Start]. A “Checking…” message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the address.

To return to the Display Check screen, select [Return].

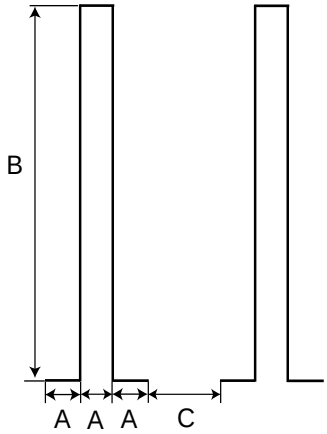


Graphic Check

This screen allows you to check the graphic screen display by displaying the following screens.
To select them, use the up, down, left, or right arrow key on the control panel.
White whole screen → Red whole screen → Green whole screen → Blue whole screen → "H" pattern screen → White whole screen
To return to the Display Check screen, press the center key on the control panel.

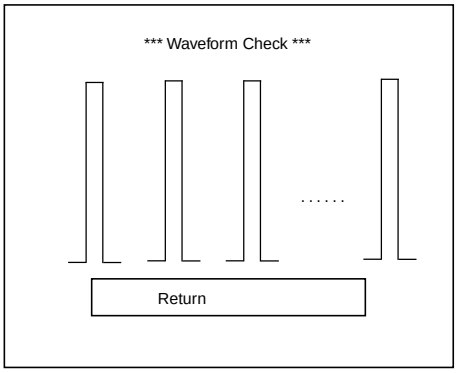
Waveform Check

This screen allows you to check the waveform screen display by displaying the following screen.
There are 12 rectangular waveforms which show the waveform traces 1 to 6 on the W1 screen and the waveform traces 1 to 6 on the W2 screen.
To return to the Display Check screen, select [Return].



A: 10 pixels
B: 100 pixels
C: 20 pixels

Waveform: white
Smoothing bit S1: red
Smoothing bit S2: blue
Smoothing bit S3: green

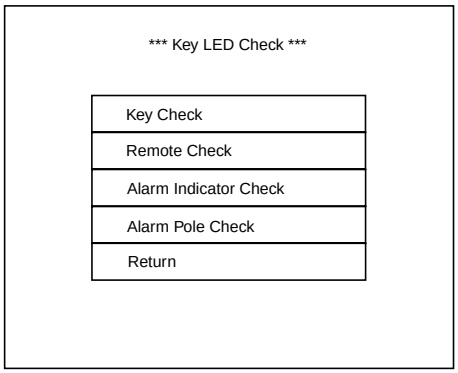


Backlight Check

This screen allows you to check the backlight brightness control by displaying the white whole screen.
Use the up or down arrow key on the control panel to increase or decrease the brightness.
To return to the Display Check screen, press the center key on the control panel.

Key LED Check

On the MU Manual Check screen, select [Key LED Check]. The Key LED Check screen, which checks the keys and LED functions, appears. On the Key LED Check screen, the following checks are available. To return to the MU Manual Check screen, select [Return].



Key Check

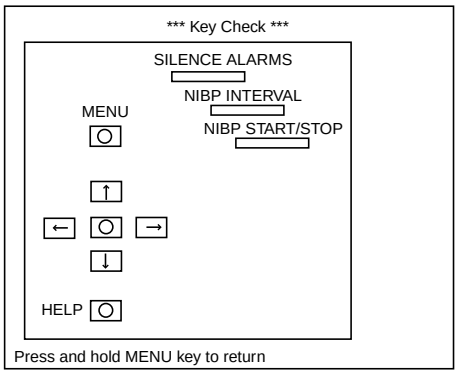
This screen allows you to check the front power switch and the keys on the control panel.

All the keys are displayed on the screen. Press one of the keys and confirm that the corresponding key display is reverse shaded in the color on the screen. If not, the key may have a failure.

If the center key has no failure, the screen returns to the Key LED Check screen after the corresponding key display is reverse shaded when the center key on the control panel is pressed.

NOTE

Pressing the front power switch does not turn off the main unit in this check.

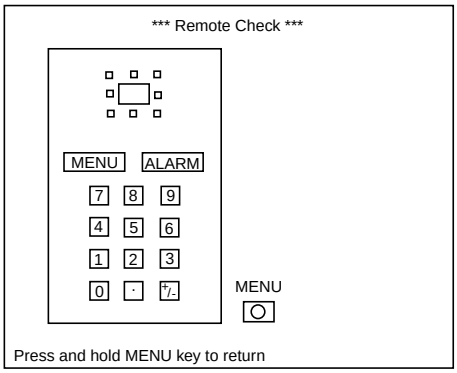


Remote Check

This screen allows you to check the keys on the remote control.
All the keys are displayed on the screen. Press one of the keys and confirm that the corresponding key display is reverse shaded in the color on the screen. If not, the key may have a failure.
If the selection knob has no failure, the screen returns to the Key LED Check screen after the corresponding key display is reverse shaded when the selection knob is pressed at the center of its position.
Pressing the center key on the control panel is another way to return to the Key LED Check screen.

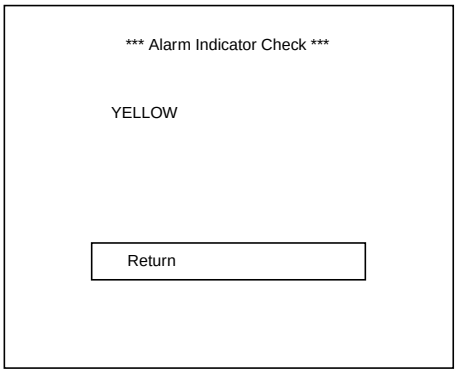
NOTE

Pressing the power button does not turn off the main unit in this check.



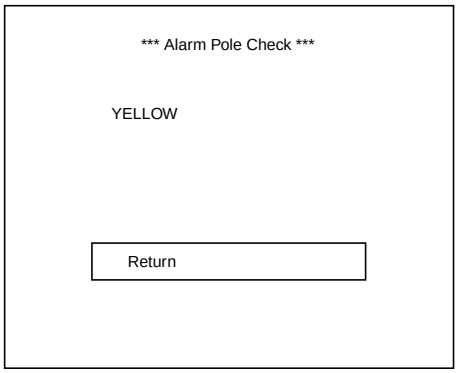
Alarm Indicator Check

This screen allows you to check the LEDs of the alarm indicator.
To select the LED color (red or yellow), use the up, down, left, or right arrow key on the control panel. The selected color LEDs blink at the alarm indicator.
To return to the Key LED Check screen, press the center key on the control panel so that [Return] is executed



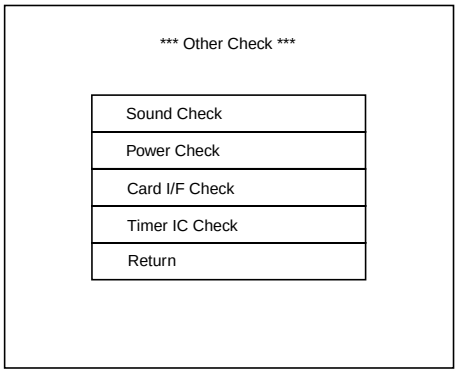
Alarm Pole Check

This screen allows you to check the LEDs of the optional alarm pole.
Connect the alarm pole to the main unit and use the up, down, left, or right arrow key on the control panel to select the color (red, yellow, or green). The selected color LEDs blink at the alarm pole.
To return to the Key LED Check screen, press the center key on the control panel so that [Return] is executed.



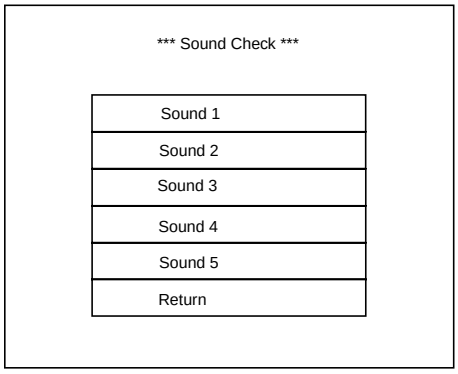
Other Check

On the MU Manual Check screen, select [Other Check]. The Other Check screen appears. On the Other Check screen, the following checks are available. To return to the MU Manual Check screen, select [Return].



Sound Check

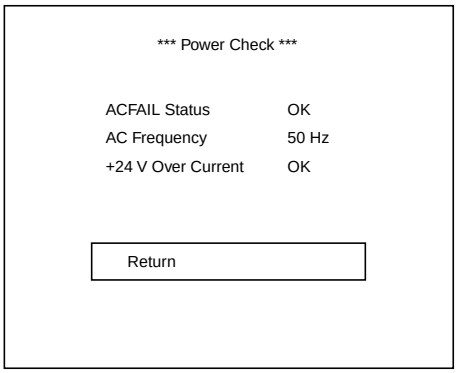
This screen allows you to check the FM sound source and audio amplifier. The following checks are available.



[Sound 1]: Generates each alarm sound continuously.
[Sound 2] to [Sound 5]: Generate a musical scale of one octave. Sound 2 is lowest pitch. The difference between Sound 2 and Sound 3, between Sound 3 and Sound 4, and between Sound 4 and Sound 5 is one octave.
[Return]: Returns to the Other Check screen.

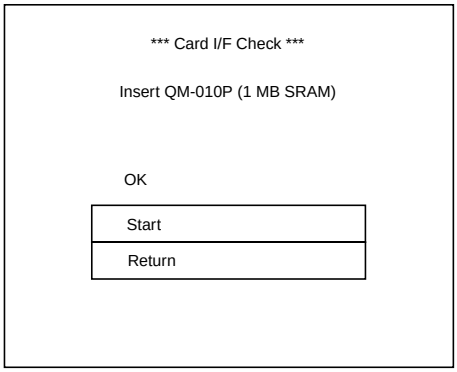
Power Check

This screen allows you to check the status signals from the power supply unit and 24 V for an external unit in future. The following checks are available. This screen checks each status (AC fail status, AC line frequency automatic detection, +24 V over current fail status) in real time.
To return to the Other Check screen, press the center key on the control panel so that [Return] is executed.



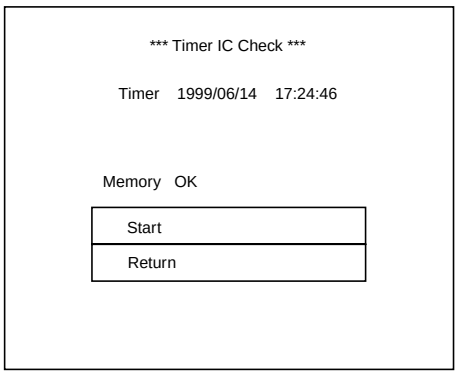
Card I/F Check

This screen allows you to check the memory card interface by writing the test data into the memory card and reading the stored data from the memory card.
To start the check, insert the optional memory card into the slot of the main unit and select [Start]. A “Checking…” message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the address.
To return to the Other Check screen, select [Return].



Timer IC Check

This screen allows you to check the memory of the real time clock IC by writing the test data into the memory and reading the stored data from the memory. The current time is displayed on the screen. Before the check, the previous data stored into the memory is backed up. The backed-up data is written into the memory again when the screen returns to the Other Check screen after the check.
To start the check, select [Start]. A “Checking…” message is displayed during the check. After the check, OK or Error appears. If an error occurs, the Error is displayed with the address.
To return to the Other Check screen, select [Return].



Section 4 Board/Unit Description

Signal Flow 4.1
Vital Sign Signals from Patients 4.1
Display Data 4.1
Power Control Signal by Front Power Switch or Power Button on Optional Remote Control 4.1
MAIN Board UR-3485 ..... 4.2
EXT JA Board UR-3489 ..... 4.2
JA Motherboard UR-3486 ..... 4.2
IR DETECT Board UR-3487 ..... 4.3
LCD JUNC Board UR-3504 ..... 4.3
LED Board UR-3393 ..... 4.3
OPERATION Board UR-3506 ..... 4.3
Power Supply Unit SC-036R 4.4

Signal Flow

Vital Sign Signals from Patients

The vital sign signals such as ECG/respiration wave, plethysmographic pulse wave, blood pressure waveform, and NIBP go to the modules through the electrode leads, sensor probe, transducer, and cuff and tube. These signals are digitized in the modules. The digitized data is transferred to the MAIN board through the JA motherboard.

Display Data

On the MAIN board, the CPU writes the binary code waveform data into the WAVE RAM area of the CRT controller (gate array IC). The CRT controller converts the waveform data to graphic data and writes it into the WAVE RAM area. The CPU writes alphanumeric data and review data such as trendgraph into the GRAPH RAM area of the CRT controller. The CRT controller mixes the data in the WAVE RAM and GRAPH RAM area to create the display data for screen. The CRT controller converts the display data to RGB signals which go to the LCD unit.

Power Control Signal by Front Power Switch or Power Button on Optional Remote Control

When the AC power switch on the rear panel is set to on, the BSM-9510 is on standby. The MAIN board outputs the power control signal to the power supply unit when the power switch on the front panel or power button on the optional remote control is pressed during standby. The power control signal allows the BSM-9510 to turn on or be on standby.

MAIN Board UR-3485

The MAIN board has one 68EN360 which is used as the CPU of the BSM-9510. The CPU clock is 25 MHz.
The following components are mounted on this board.

- Flash memory for system program: Has the ROM and RAM area on which the system program runs.
- Flash E2PROM: Included in the flash memory. Stores the conditions set on the System Setup screen.
- Real time clock (RTC): Used for date and time.
- Key operation controller: Reads the status of the front power switch and each key on the control panel
- Ethernet driver: Used for local area network LAN.
- RS232C driver: Used for communication with an external unit in future or a personal computer.
- CRT controller: Converts the screen data to RGB signals and outputs them to the LCD unit.

EXT JA Board UR-3489

This daughter board has a socket for connection of external units in the future and is mounted on the MAIN board.

JA Motherboard UR-3486

This board has 6 sockets for modules. This board is connected to the MAIN board. The MAIN board communicates with the modules through this board. External units in the future will also communicate with the MAIN board through the EXT JA board and this board.

IR DETECT Board UR-3487

This board has the infrared sensor for remote control and outputs the remote control signals to the MAIN board.

LCD JUNC Board UR-3504

This daughter board is mounted on the LCD unit and converts the signals from the MAIN board to the LCD unit.

LED Board UR-3393

This board has LEDs for alarm indicator and is mounted inside the top of the display.

OPERATION Board UR-3506

This board has switches for key operation and is mounted into the control panel.

Power Supply Unit SC-036R

The power supply unit has the following outputs.

- $+5V_D$ constant voltage output: Used for all the digital circuits.
- $+5V_S$ constant voltage output: Used for the front power switch activation in standby mode.
- $+12V_U$ constant voltage output: Used for the LCD backlight and alarm indicator LEDs
- $+V_{JA}$ constant voltage output: Used for the JA motherboard and modules.
- $+24V_C$ constant voltage output: Will be used for future external units.

The power switch on the front panel turns on or off the outputs except $+5V_S$ when the $+5V_S$ output is turned on. If the $+5V_S$ output is turned off, the power switch has no function. The AC power switch on the rear panel turns on the $+5V_S$ output only or turns it off together with the other outputs.

When an external unit (future) is connected to the socket, the $+24V_C$ output is turned on.

This power supply unit allows BSM-9510 to resume monitoring after power recovery if the BSM-9510 has momentary power loss during monitoring.

Section 5 Disassembly and Assembly

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Warnings and Cautions 5.1
Required Tools 5.1
Replacing MAIN Board 5.2
Replacing Fuse 5.5
Replacing Power Supply Unit 5.7
Replacing JA Motherboard 5.10
Replacing IR DETECT Board 5.13
Replacing LCD Unit 5.16
Replacing DC-AC Inverter 5.19
Replacing Backlight Lamps 5.22
Replacing LCD Filter 5.26
Replacing OPERATION Board 5.29
Replacing Lithium Battery 5.32

The procedures in this section tell how to remove, replace and install major components in the instrument.

Before You Begin

Removing, replacing and installing major components should be done by qualified service personnel.

Warnings and Cautions

WARNINGS

- **To avoid the possibility of injury to yourself or damage to the instrument, do not install or remove any component or change switch settings while the power is on and wait 10 minutes after the power is off before installing or removing any component from the instrument.**
- **To avoid accidental discharge of static electricity which could damage the instrument components, use a wrist ground strap when installing or removing any component of the instrument.**

CAUTIONS

- **Before connecting or disconnecting any cables, turn off the instrument and unplug the AC power cord from the instrument.**
- **Fuses cut off the power when an abnormality occurs in the instrument. Eliminate the malfunction before replacing the fuse. Use the correct fuse* only. The fuse rating is shown on the printed circuit board of the power supply unit.**
- **Removal and replacement of any component in the instrument should be done by qualified service personnel.**
- **Use only parts recommended by Nihon Kohden to assure maximum performance from your instrument.**

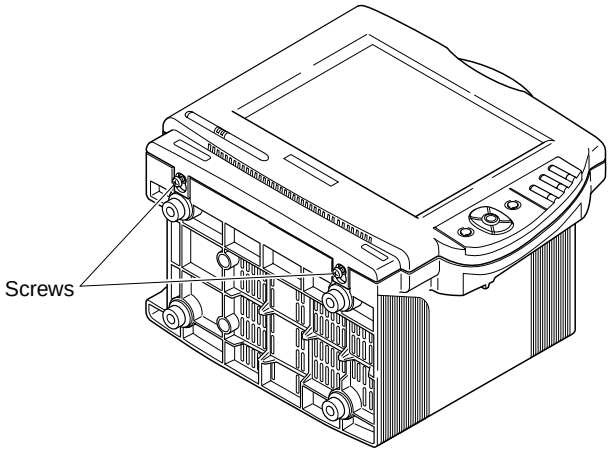
* Refer to Section 8 “Replaceable Parts List”.

Required Tools

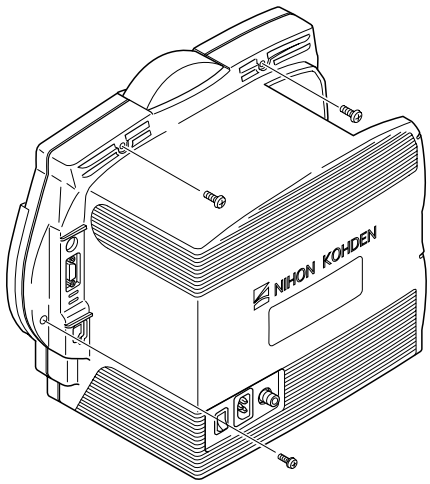
- Anti-static bench mat
- Wrist ground strap
- M3 Phillips screwdriver (insulated type)
- M4 Phillips screwdriver (insulated type)
- Small flat-blade screwdriver (insulated type)

Replacing MAIN Board

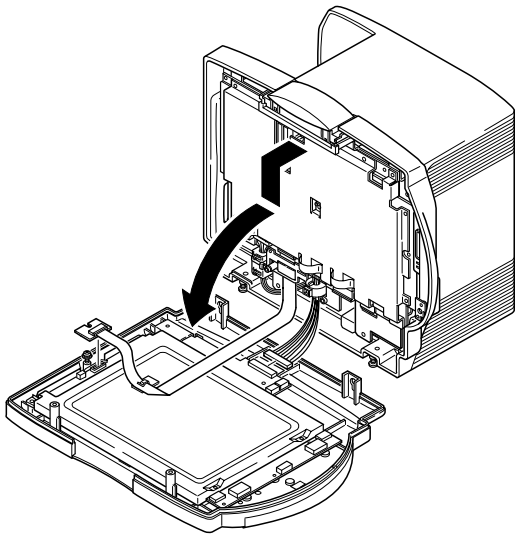
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.

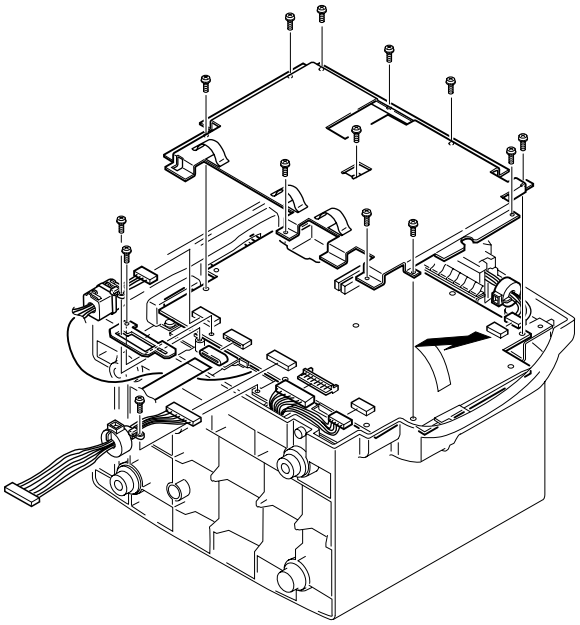


4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

6. Lay the main unit on its back. Remove the 2 screws (M3 binding head screws) which hold the ferrite core on its holder. Disconnect all 6 cables at the MAIN board. The 6 cables are as follows:
   - Cable between JA Motherboard and MAIN boards
   - Cable between LCD JUNC and MAIN boards
   - Cable between IR DETECT and MAIN boards
   - Cable between LED and MAIN boards
   - 2 cables between power supply unit and MAIN board

   Remove the 12 screws (M3 pan head screws with spring washer) which hold the shield case 2 and MAIN board. Remove them from the main unit.



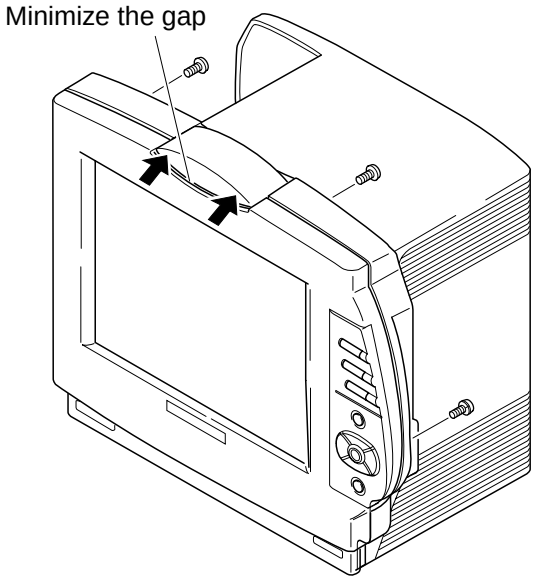
7. Replace the MAIN board with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

NOTE

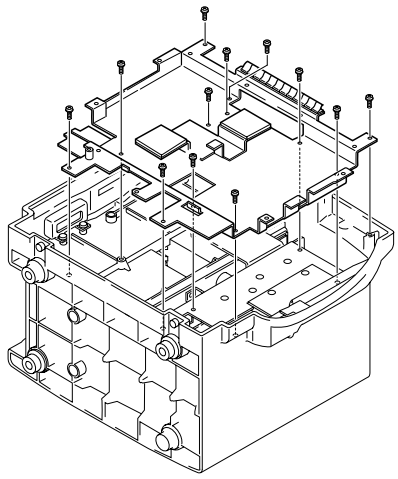
When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.



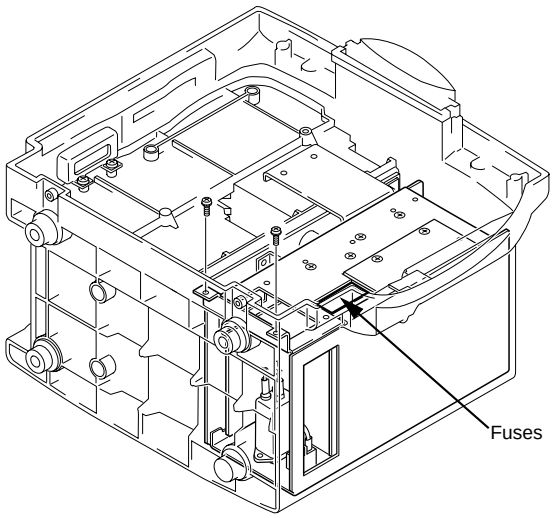
Replacing Fuse

1. Remove the MAIN board according to the “Replacing MAIN board” section.

2. Remove the 12 screws (M3 pan head screws with spring washer) which hold shield case 1. Remove the shield case from the main unit.



There is a square hole as shown below. You can see the two fuses through the square hole.



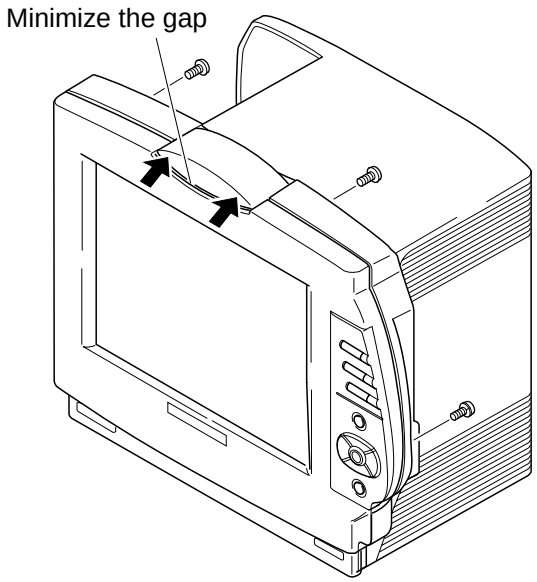
3. Replace the blown fuse(s) with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or stretch the cables.

NOTE

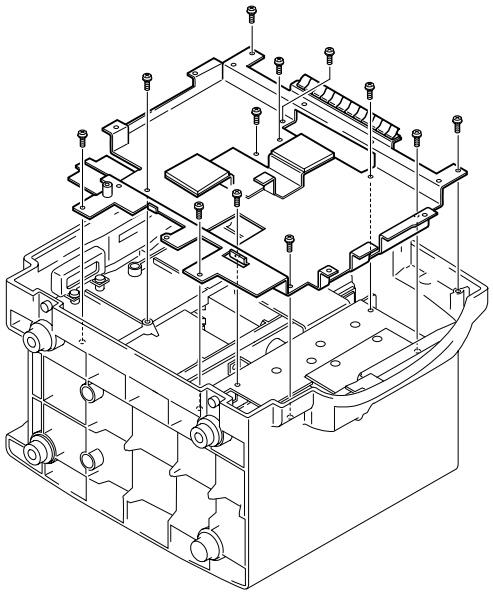
When attaching the front cover assy to the main unit, minimize the gap between the top of the front cover assy and the alarm indicator of the main unit.



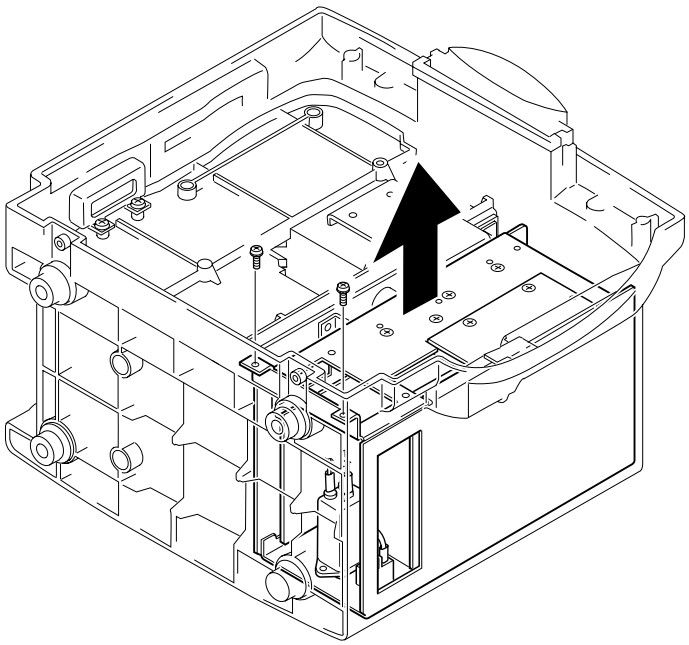
Replacing Power Supply Unit

1. Remove the MAIN board according to the “Replacing MAIN Board” section.

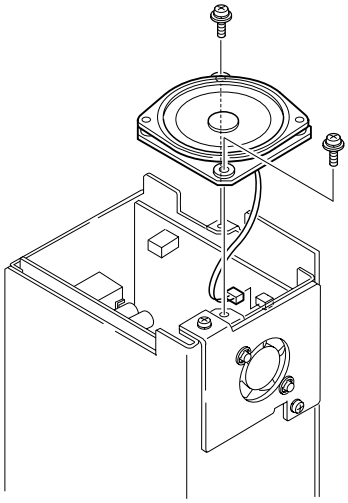
2. Remove the 12 screws (M3 pan head screws with spring washer) which hold shield case 1. Remove it from the main unit.



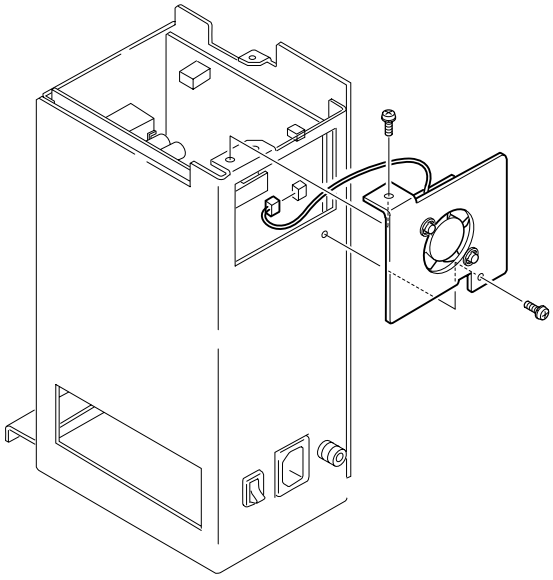
3. Remove the 2 screws (M3 pan head screws with spring washer) which hold the power supply unit to the main unit. Remove it from the main unit.



4. Remove the 2 screws (M3 pan head screws with spring and flat washers) which hold the speaker. Remove it from the power supply unit. Disconnect the speaker cable from the power supply unit.



5. Remove the 2 screws (M3 pan head screws with spring washer) which hold the fan with holder. Remove it from the power supply unit. Disconnect the fan cable from the power supply unit.



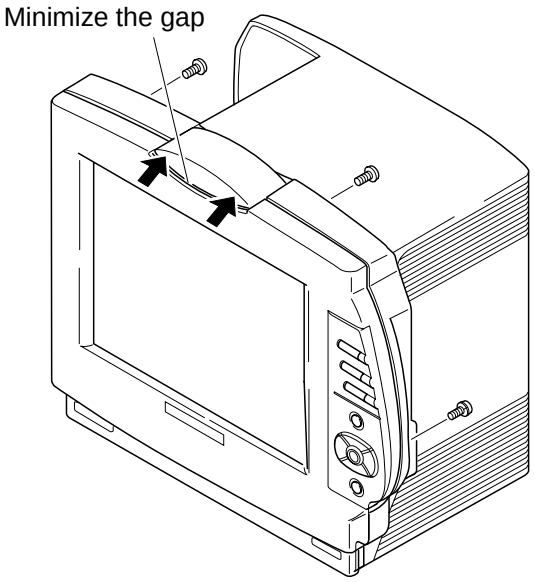
6. Replace the power supply unit with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

NOTE

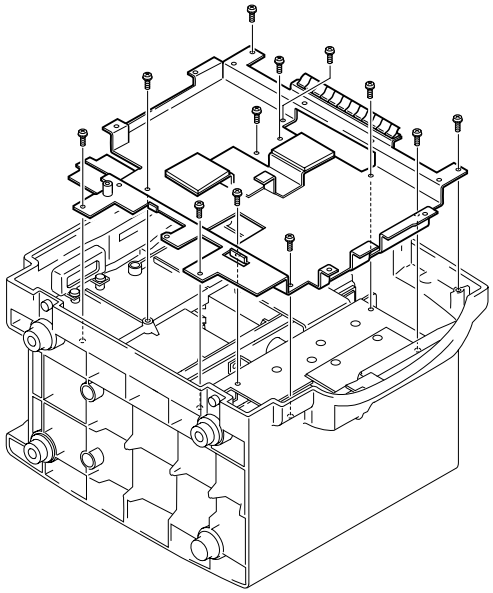
When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.



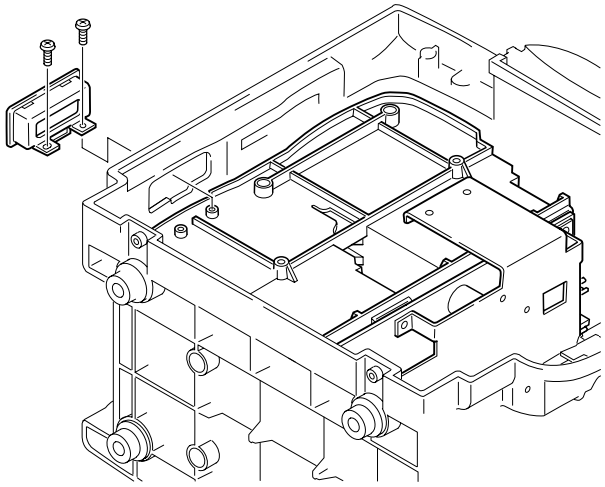
Replacing JA Motherboard

1. Remove the MAIN board according to the “Replacing MAIN Board” section.

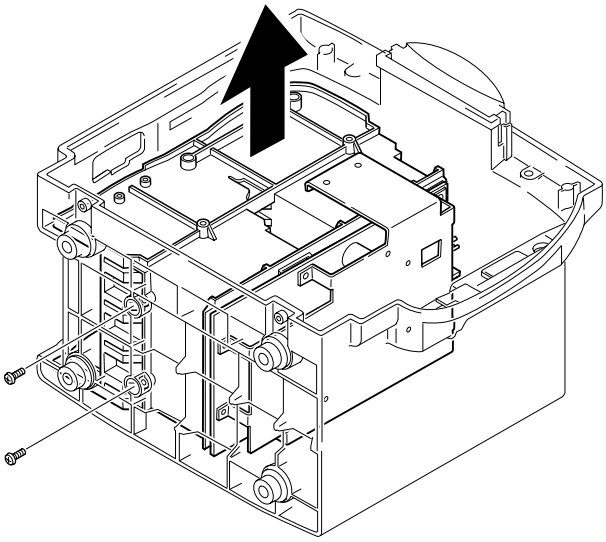
2. Remove the 12 screws (M3 pan head screws with spring washer) which hold the shield case 1. Remove it from the main unit.



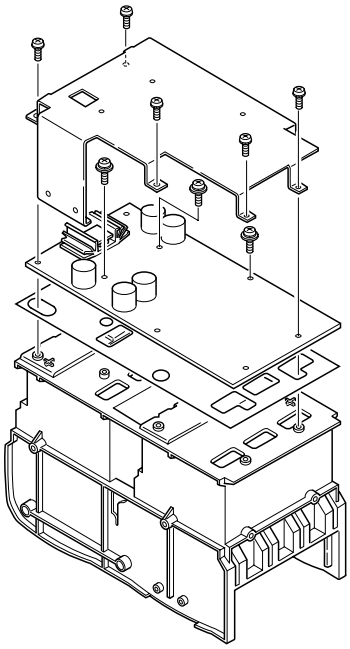
3. Remove the 2 screws (M3 binding head screws) which hold the JA socket holder. Remove it from the main unit.



4. Remove the 2 screws (M3 binding head screws) which hold the module case and JA motherboard to the main unit. Remove them from the main unit.



5. Remove the 5 screws (M3 pan head screws with spring washer) which holds the module case shield cover. Remove it from the module case. Remove the 3 screws (M3 pan head screws with spring and flat washers) which hold the JA motherboard. Remove it from the module case.



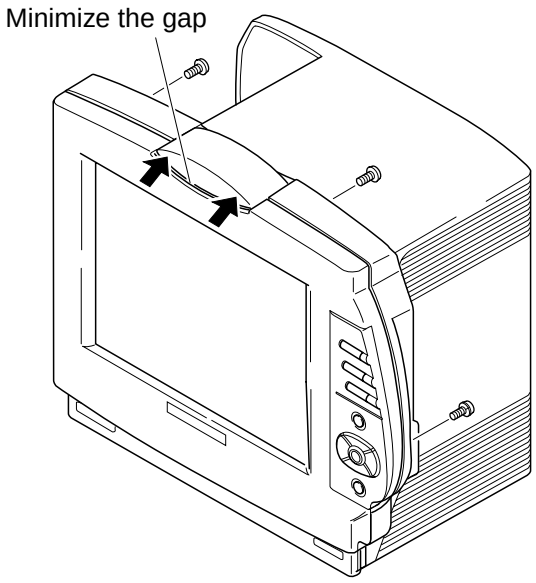
6. Replace the JA motherboard with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

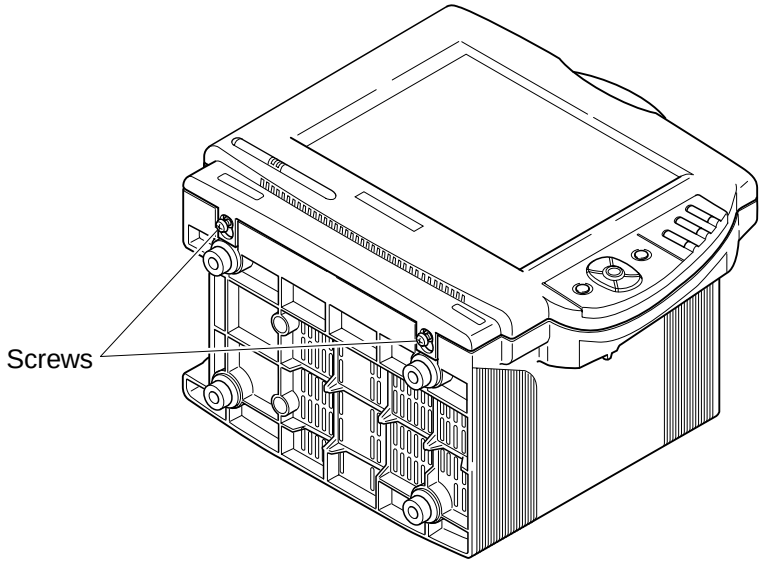
NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.

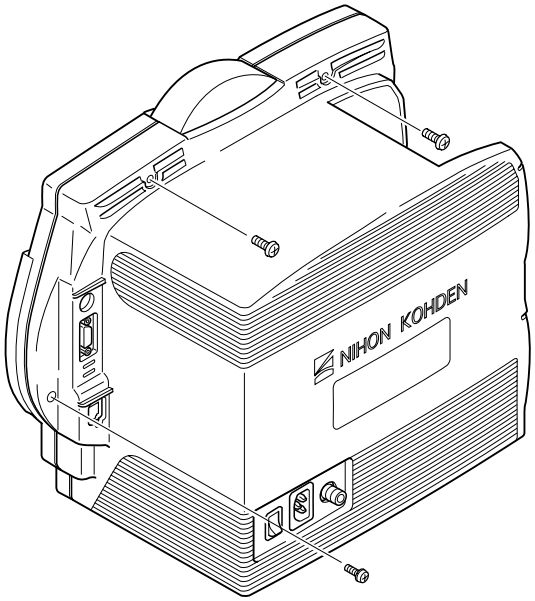


Replacing IR DETECT Board

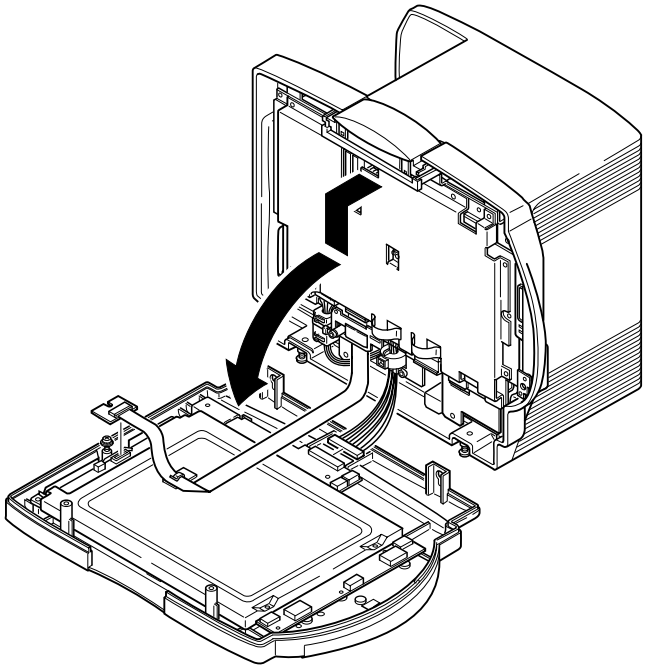
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



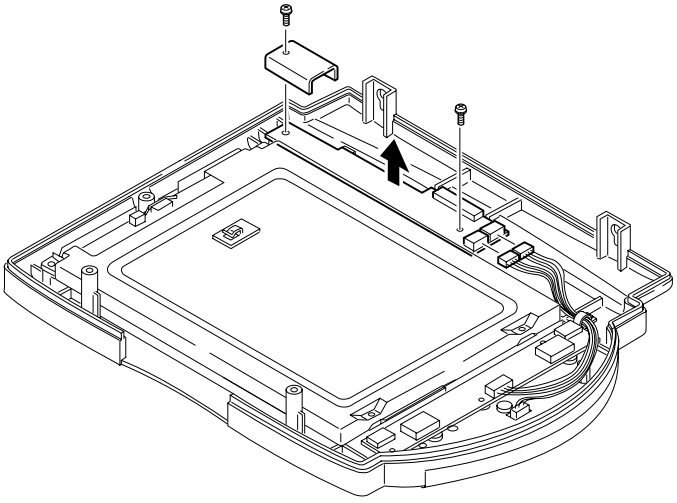
3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.



4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

6. Disconnect the cable between the IR DETECT board and DC-AC inverter at the IR DETECT board. Remove the 2 screws (M3 pan head screws with spring washer) which hold the IR DETECT board. Remove it from the front cover assy.



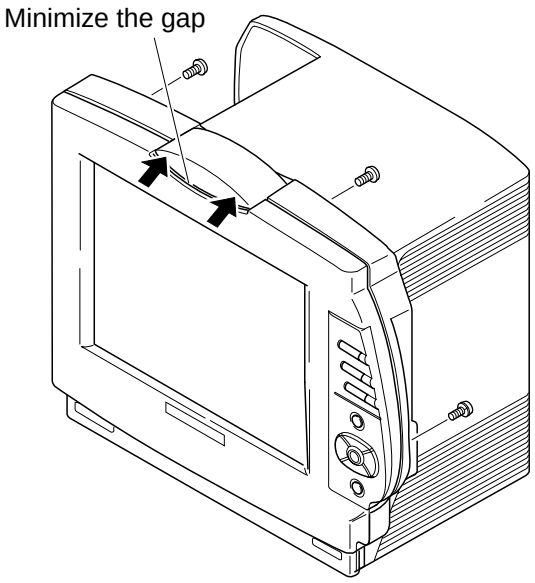
7. Replace the IR DETECT board with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

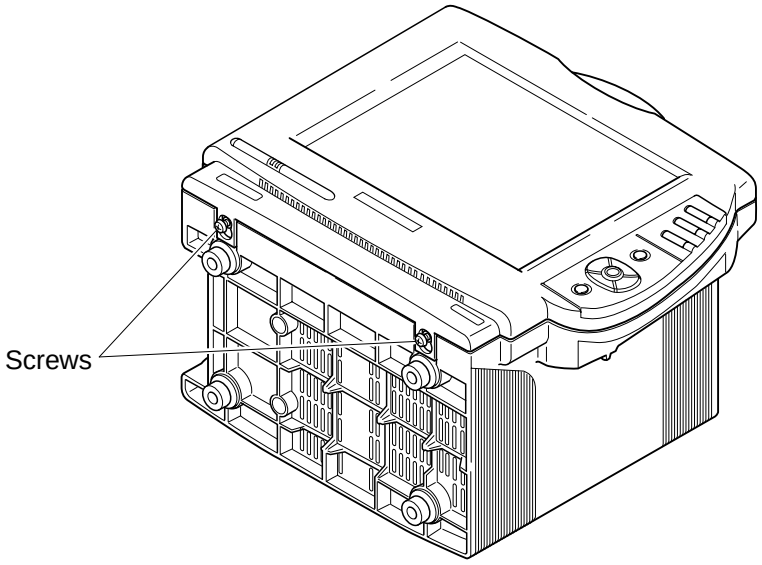
NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.

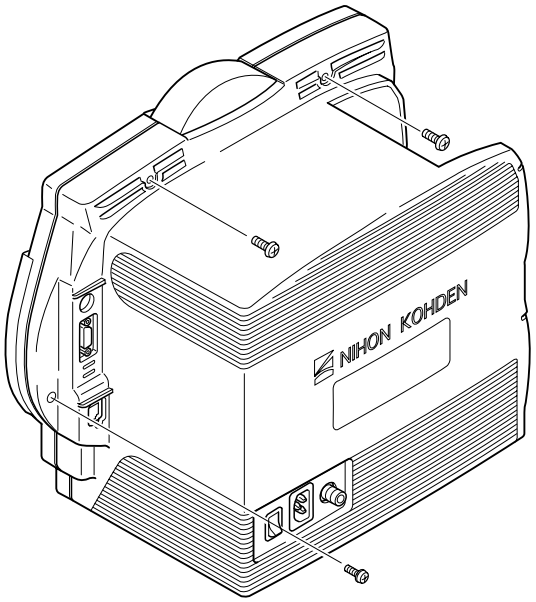


Replacing LCD Unit

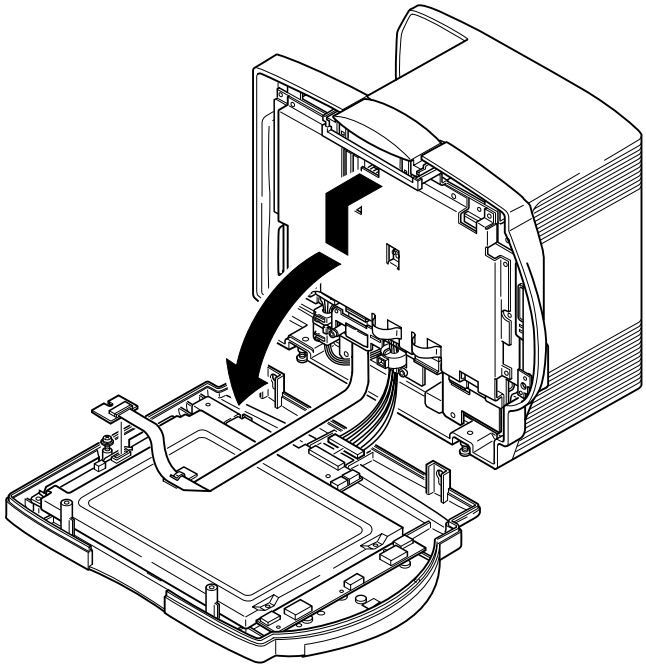
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



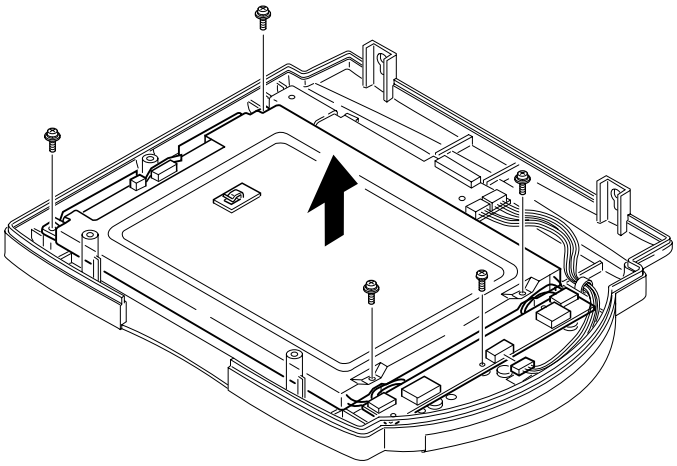
3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.



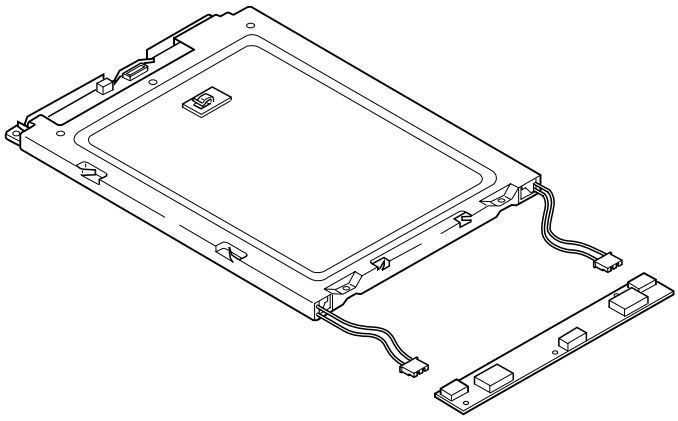
4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

6. Disconnect the cable between the IR DETECT board and DC-AC inverter at the DC-AC inverter. Remove the 4 screws (M3 pan head screw with spring and flat washers) and screw (M3 pan head screw with spring washer) which hold the LCD unit and DC-AC inverter. Remove them from the front cover assy.



7. Disconnect the 2 cables from the DC-AC inverter to separate the LCD unit and DC-AC inverter.



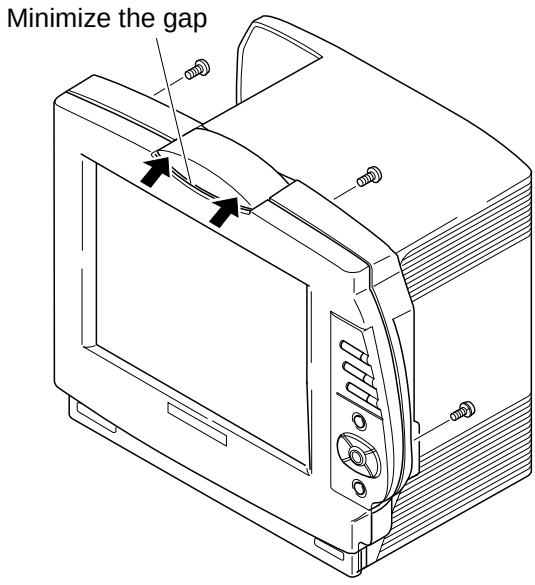
8. Replace the LCD unit with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

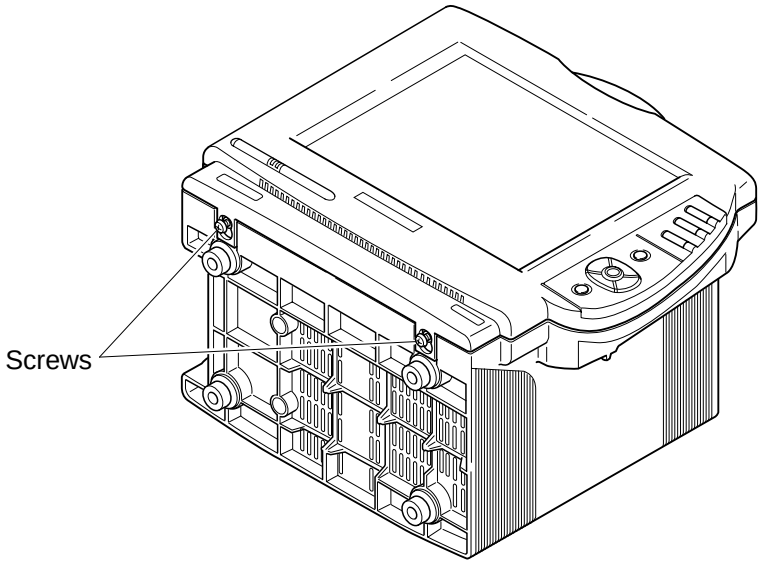
NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.

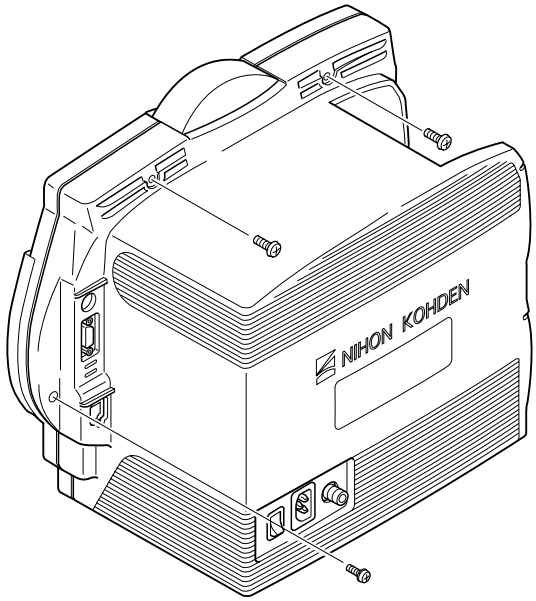


Replacing DC-AC Inverter

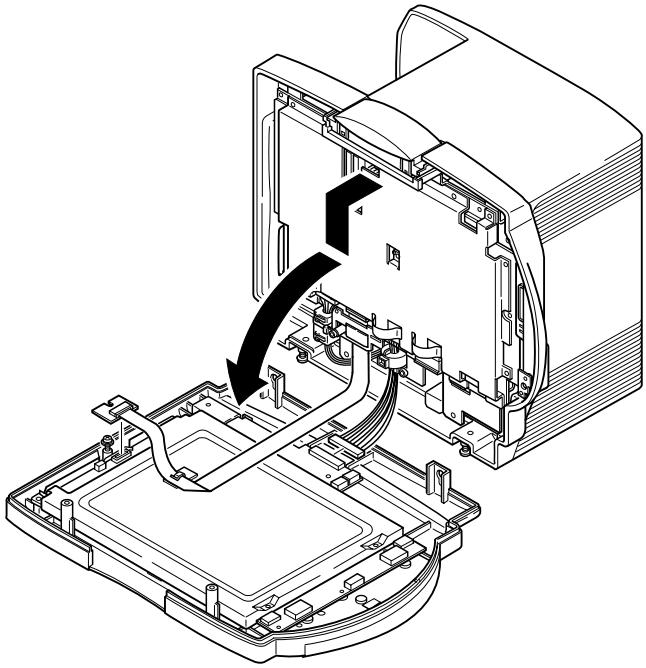
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



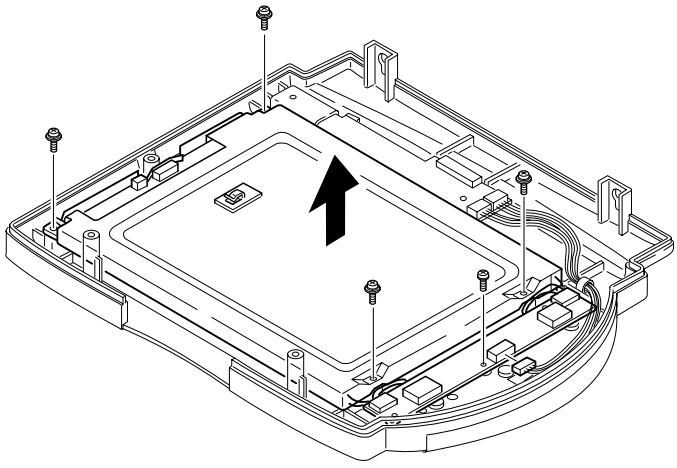
3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.



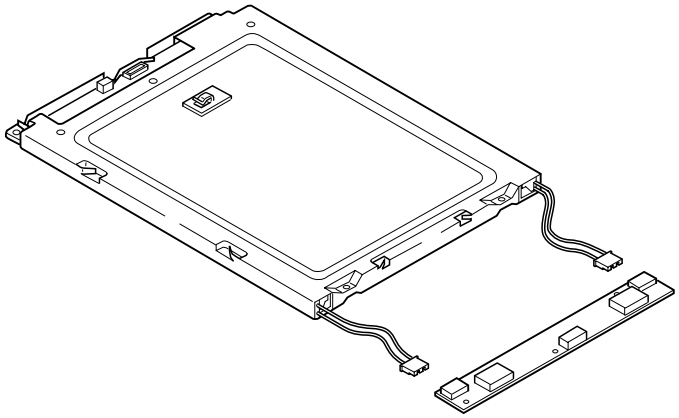
4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

6. Disconnect the cable between the IR DETECT board and DC-AC inverter at the DC-AC inverter. Remove the 4 screws (M3 pan head screw with spring and flat washers) and screw (M3 pan head screw with spring washer) which hold the LCD unit and DC-AC inverter. Remove them from the front cover assy.



7. Disconnect the 2 cables from the DC-AC inverter to separate the LCD unit and DC-AC inverter.



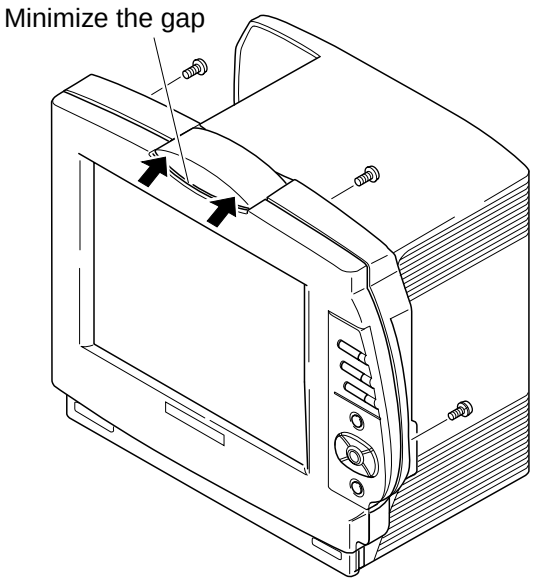
8. Replace the DC-AC inverter with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.

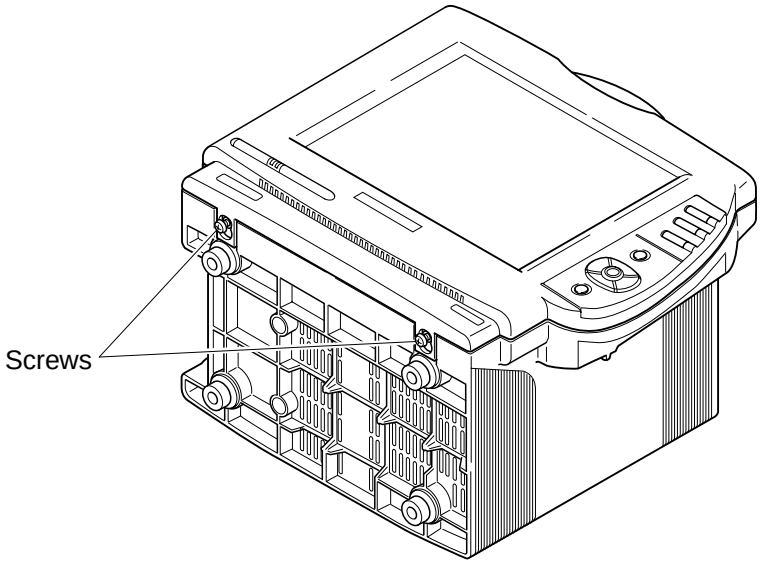


Replacing Backlight Lamps

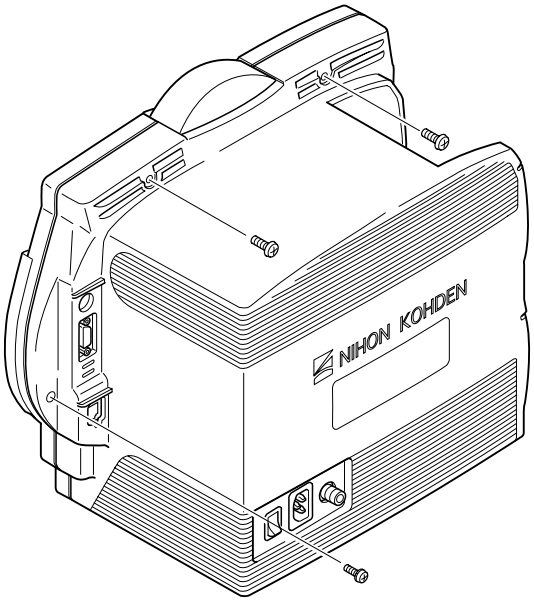
NOTE

Always replace both backlight lamps together even if one works well.

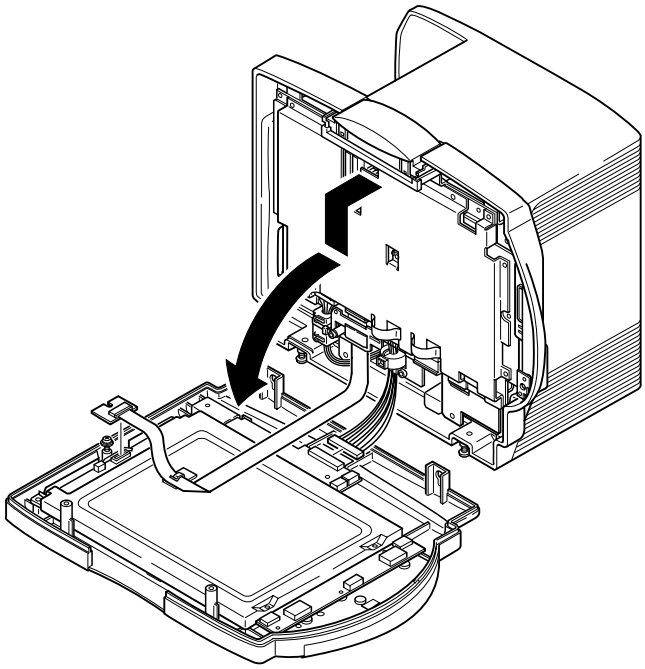
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



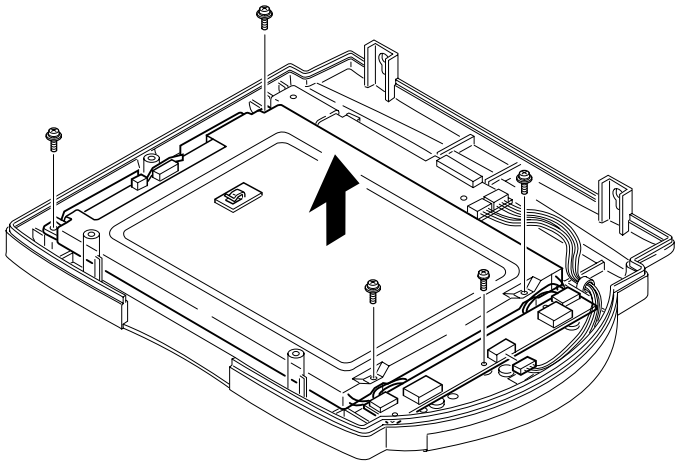
3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.



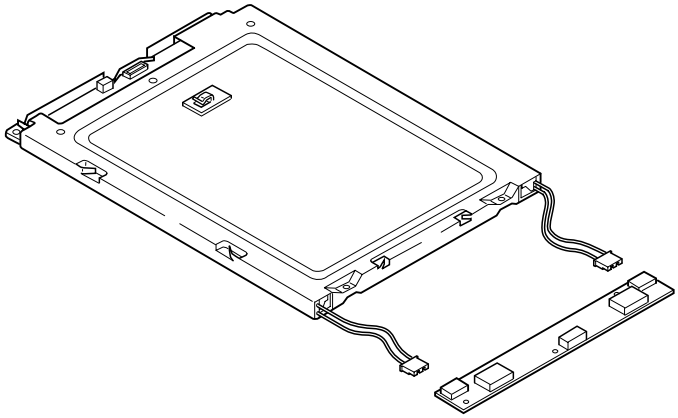
4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

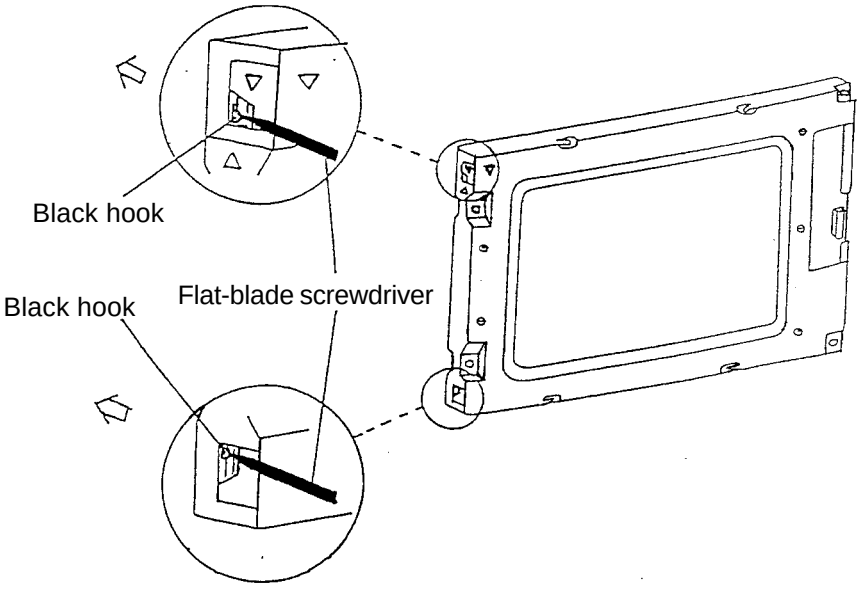
6. Disconnect the cable between the IR DETECT board and DC-AC inverter at the DC-AC inverter. Remove the 4 screws (M3 pan head screw with spring and flat washers) and screw (M3 pan head screw with spring washer) which hold the LCD unit and DC-AC inverter. Remove them from the front cover assy.



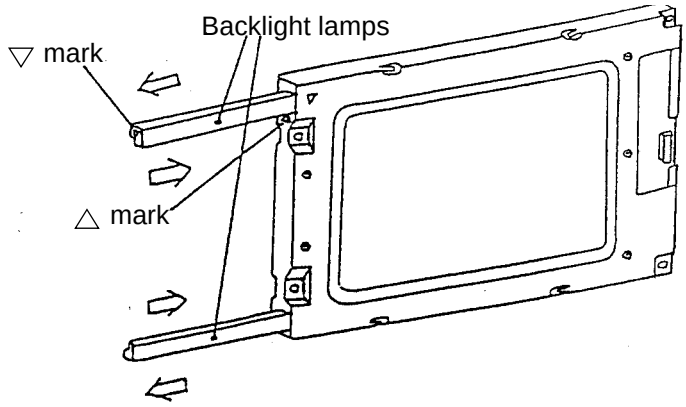
7. Disconnect the 2 cables from the DC-AC inverter to separate the LCD unit and DC-AC inverter.



8. Remove the 2 backlight lamps from the LCD unit by moving the black hook with a small flat-blade screwdriver in the direction of the arrow.



9. Replace the 2 backlight lamps with the new backlight lamp set as shown below. The backlight lamp set consists of one backlight lamp marked with ▽ at its side and one backlight lamp without a ▽ mark at its side. The lamps are fragile and must be kept clean. Gently insert the backlight lamp marked with ▽ into the slot marked with △ until the black hook clicks. Gently insert the backlight lamp without the ▽ mark into the slot without the △ mark until the black hook clicks. Assemble the main unit by reversing the above procedure.

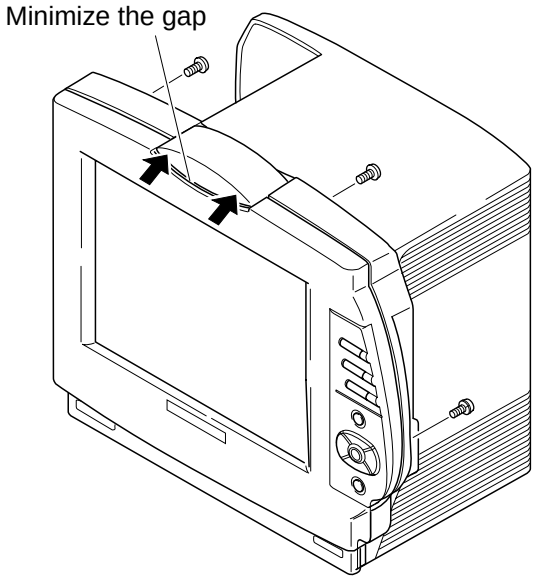


CAUTION

Be careful not to pinch or strain the cables.

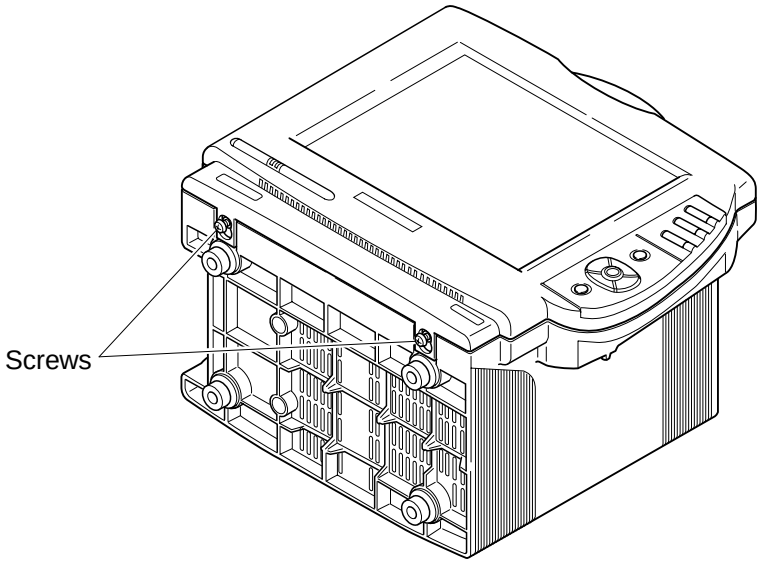
NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.

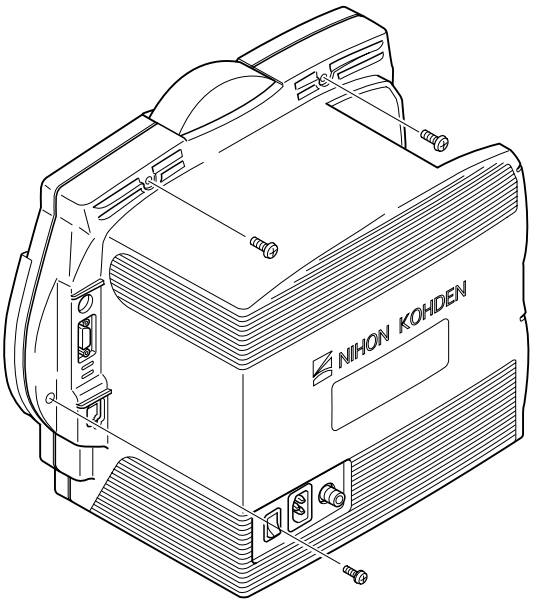


Replacing LCD Filter

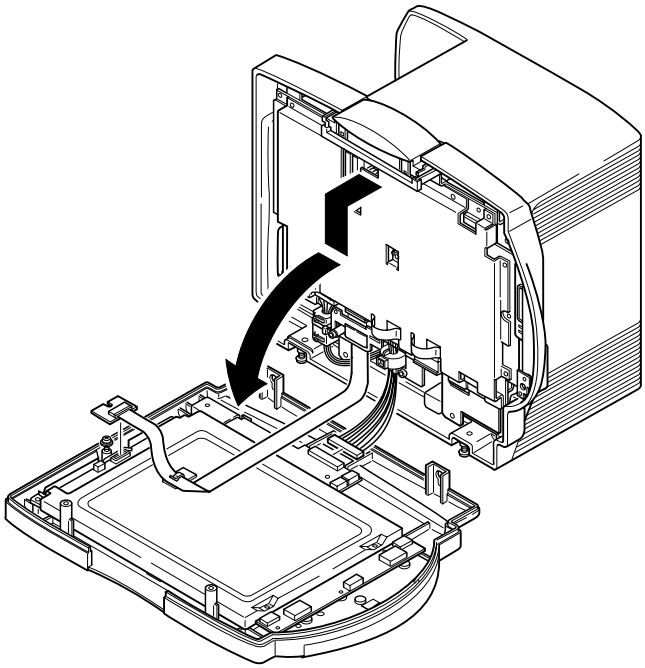
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



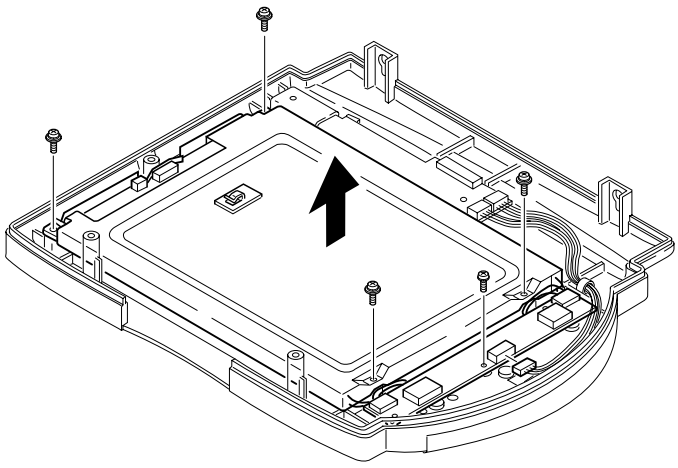
3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.



4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

6. Disconnect the cable between the IR DETECT board and DC-AC inverter at the DC-AC inverter. Remove the 4 screws (M3 pan head screw with spring and flat washers) and screw (M3 pan head screw with spring washer) which hold the LCD unit and DC-AC inverter. Remove them from the front cover assy.

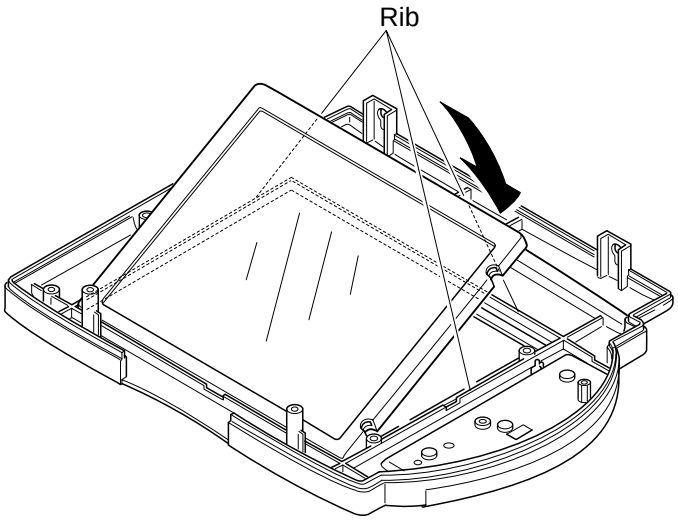


7. Remove the LCD filter together with the packing. Remove the packing from the LCD unit.

8. Replace the LCD filter with a new one and assemble the main unit by reversing the above procedure.

NOTE

When attaching the LCD filter with packing into the original position, be careful not to leave an edge of the LCD filter with packing on a rib of the front cover.

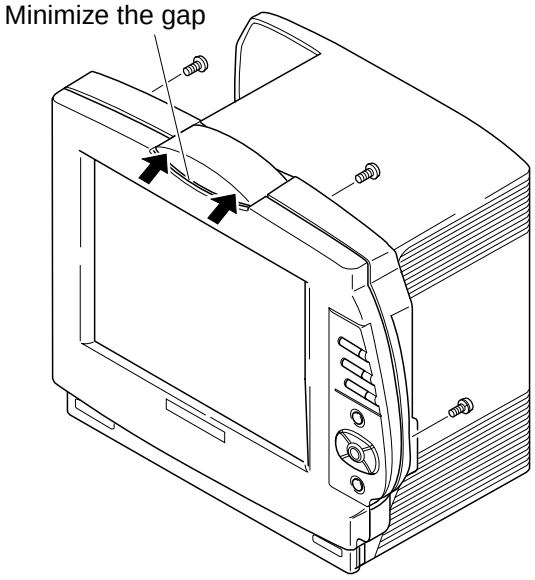


CAUTION

Be careful not to pinch or strain the cables.

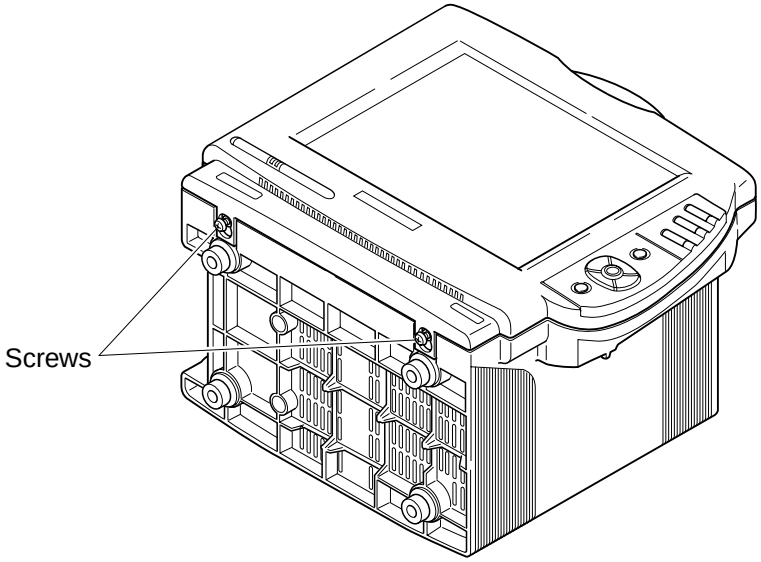
NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.

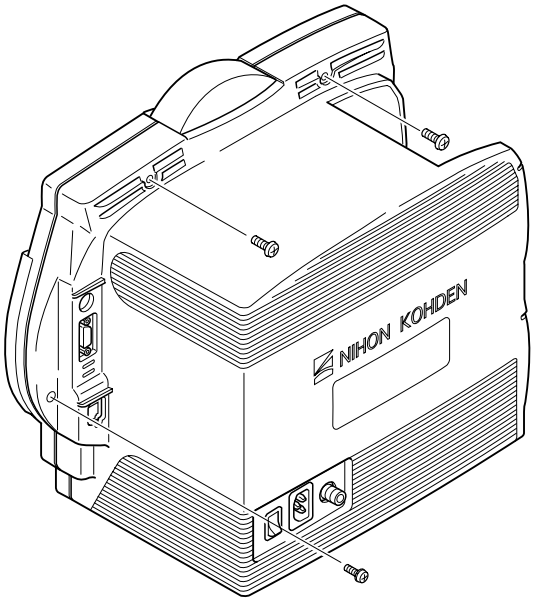


Replacing OPERATION Board

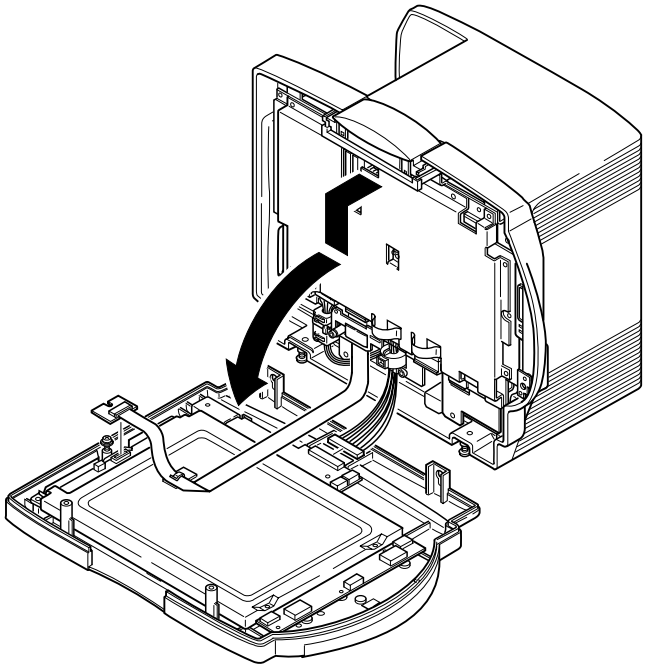
1. Loosen the 2 screws (M4 binding head screws) at the bottom of the main unit.



2. Remove the 2 screws (M4 binding head screws) at the top of the rear cover and the screw (M3 pan head screw with spring washer) at the rear of the control panel.



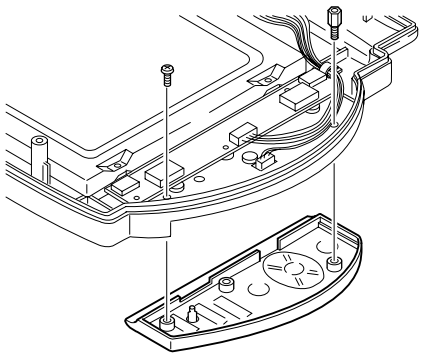
3. Slightly pull out the front cover assy until the 2 loosened screws are in the clearance holes at the bottom of the front cover assy. Move the front cover assy downward until the screws come out of the clearance holes. Put the front cover assy on a smooth, soft surface to avoid scratching the screen.



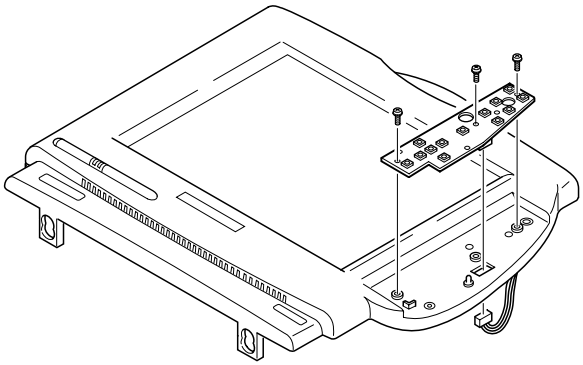
4. Loosen the screw (M3 pan head screw with spring and flat washers) which holds the LCD JUNC board with ribbon cable. Remove it from the front cover assy.

5. Disconnect the cable between the MAIN board and IR DETECT board at the IR DETECT board to separate the front cover assy from the main unit.

6. Remove the screw (M3 binding head screw) and spacer bolt which hold the control panel assy 2. Remove it from the front cover assy.



7. Remove the 3 screws (M3 pan head screws with spring washer) which hold the OPERATION board. Remove it from the front cover assy.



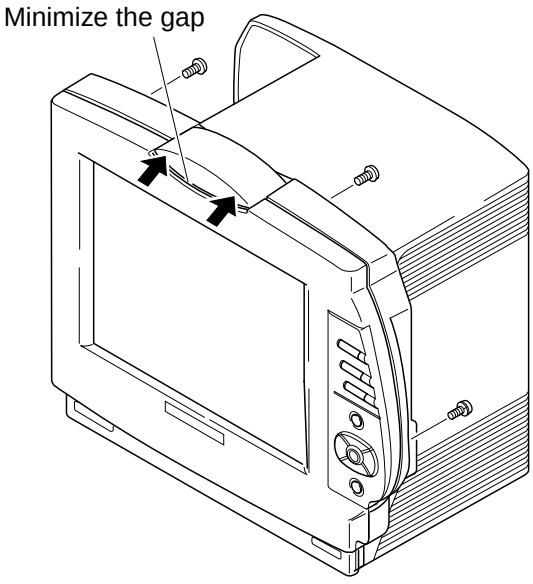
8. Replace the OPERATION board with a new one and assemble the main unit by reversing the above procedure.

CAUTION

Be careful not to pinch or strain the cables.

NOTE

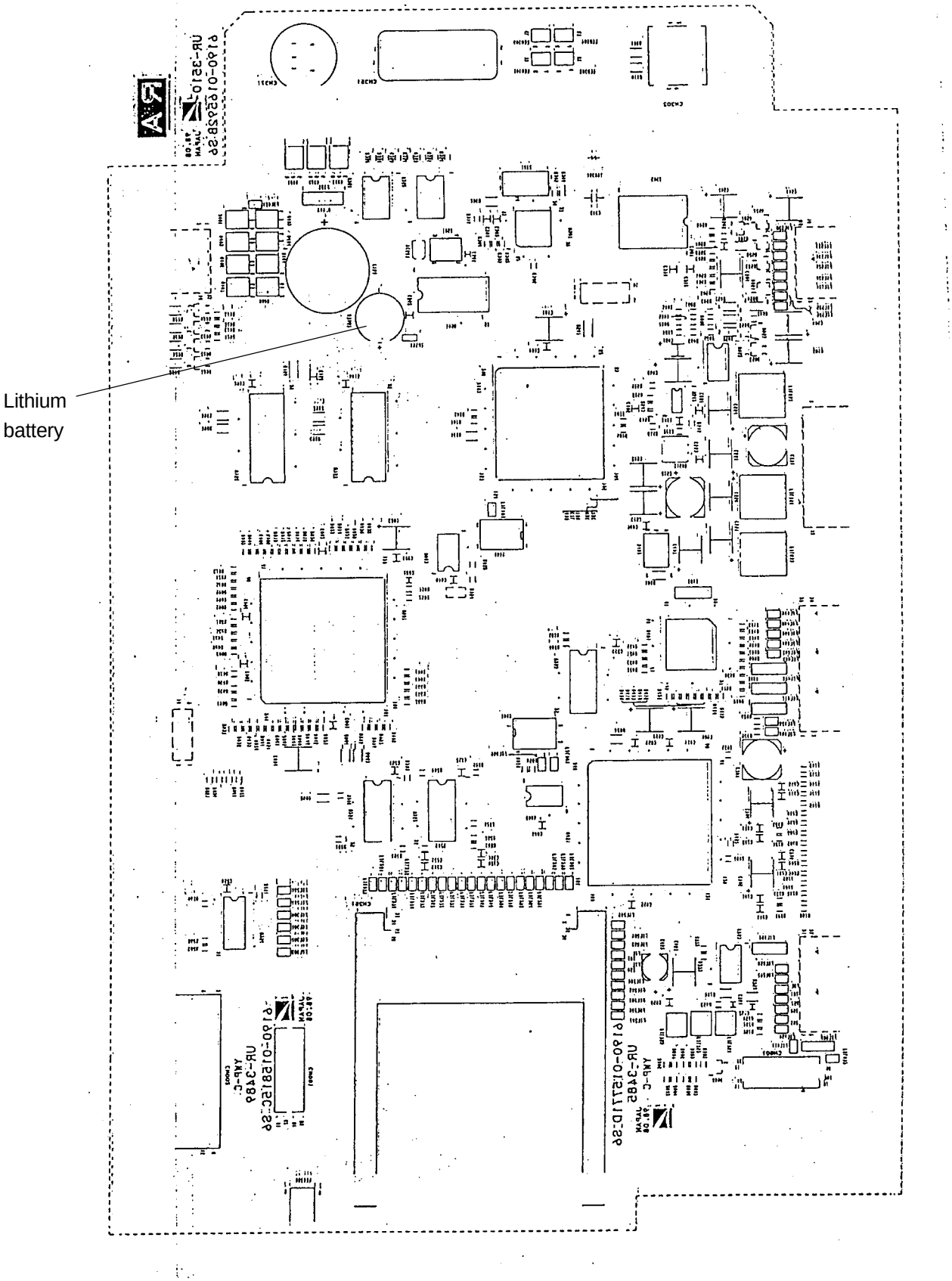
When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.



Replacing Lithium Battery

1. Remove the MAIN board according to the “Replacing MAIN Board” section.

2. Remove the lithium battery on the MAIN board with a soldering iron.



3. Solder the new lithium battery onto the original position of the MAIN board.

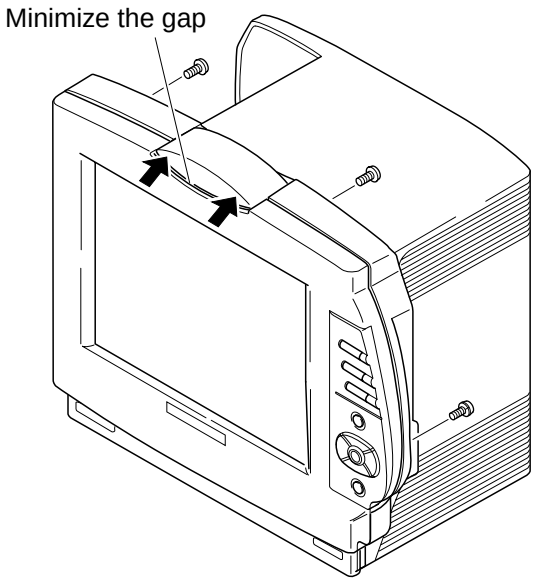
4. Assemble the main unit according to the reverse order of the “Replacing MAIN Board” section.

CAUTION

Be careful not to pinch or strain the cables.

NOTE

When attaching the front cover assy to the main unit, minimize the gap between the top of front cover assy and alarm indicator of the main unit.



Section 6 Maintenance

Maintenance Check Items 6.1
- External 6.1
- Safety 6.2
- Modules 6.2
- Display 6.3
- Measuring Parameters 6.3
- Recorder 6.3
- Backup 6.3
- Others 6.4

Maintenance Check Items

Maintenance check sheets are provided at the end of this section. Make a copy of this check sheet before using it. Check all the items on this check sheet when doing any service or maintenance. The check sheet contains the check items grouped as follows:

- External
- Safety
- Modules
- Display
- Measuring Parameters
- Recorder
- Backup
- Others

The rest of this section describes how to check each of the above items.

External

Item	Check Procedure	Action at Error Occurrence
Dirt	Check that the outside of the instrument is not dirty.	If the outside of the instrument is dirty, clean it with a cloth moistened with neutral soap or alcohol.
Loose screws	Check that there are no loose screws.	If any screw is loose, tighten it.
Damaged or bent parts	Check that there are no physically damaged or bent parts. This includes switch, key top cover, cable, cord and pins on the connector or socket.	If any part is damaged or bent, replace it.
Abnormal vibration or resonant sound	Check that the instrument has no abnormal vibration and resonant sound.	Remove the cause of abnormal vibration or resonant sound.
Warning and caution labels	Check that the labels are clearly readable.	If a label cannot be read, replace it with a new one.
Safety standard labels such as CSA mark and CE mark	Check that the labels are clearly readable.	Replace damaged or worn labels.

Safety

Item	Check Procedure	Action at Error Occurrence
Power cord and ground lead	Check that the power cord has no physical damage and no AC cutoff, no heat, no sound and no smell while the power cord is bent at each part.	Replace the power cord if it has any damage.
	Check that the ground lead has no physical damage and no cutoff of the continuity while the ground lead is bent at each part.	Replace the ground lead if it has any damage.
Grounding	Check that the instrument is grounded to the dedicated grounding terminal in the facility.	Use the provided ground lead to ground the instrument to a dedicated grounding terminal if the instrument is not grounded.
Fuse	Check that the fuse is not blown.	Remove the cause and replace the fuse if it is blown.
Fuse type	Check that the fuse is the correct fuse type (T 4 A/250 V).	Replace the fuse with the correct type if the fuse is not correct.
AC power	Check that the input AC power is within the correct range.	Use only AC power within the correct range.
AC operation	Check that the AC power switch, standby lamp, front power switch and power lamp work normally.	If one of them has a malfunction, remove its cause.
Protective earth impedance (Refer to IEC601-1 18.(f).)	Check that the impedance between the protective earth contact and any accessible metal part does not exceed 0.1 Ω.	Remove the cause if the impedance exceeds 0.1 Ω.
Earth leakage current (Refer to IEC601-1 19.)	Check that the earth leakage current does not exceed 0.5 mArms under normal condition and 1.0 mArms under each single fault condition.	Remove the cause if the earth leakage current exceeds one of the maximum values.
Enclosure leakage current (Refer to IEC601-1 19.)	Check that the enclosure leakage current does not exceed 0.1 mArms under normal condition and 0.5 mArms under each single fault condition.	Remove the cause if the enclosure leakage current exceeds one of the maximum values.
Patient leakage current (Refer to IEC601-1 19.)	Check that the patient leakage current to type CF or defibrillation-proof type CF applied part does not exceed 0.01 mArms under normal condition and 0.05 mArms under each single fault condition.	Remove the cause if the patient leakage current exceeds one of the maximum values.
Withstand voltage (Refer to IEC601-1 20.)	Check that the instrument has the following withstand voltage. - A-a1: 1500 VAC for one minute - A-f: 1500 VAC for one minute - B-a: 4000 VAC for one minute* - B-d: 1500 VAC for one minute* * Perform the check with the module inserted.	Remove the cause if the instrument does not have one of the withstand voltages.

Modules

Item	Check Procedure	Action at Error Occurrence
Input parts on modules	Check that no input part on the modules has poor contact by connecting the corresponding input cable and slightly pulling or pushing the connector.	Replace the input cable or socket of the module if the corresponding parameter disappears during the check.

Display

Item	Check Procedure	Action at Error Occurrence
LCD screen	Check that the LCD screen is neither dirty nor damaged.	Clean the LCD or replace it with a new one.
Brightness	Check that the brightness is correctly adjusted by controlling the brightness on the Display window.	Remove the cause if the brightness cannot be adjusted.
Diagnostic check	Check that the Display check has no error.	Remove the cause if there is an error.

Measuring Parameters

Item	Check Procedure	Action at Error Occurrence
Waveform and numeric data	Check that the waveform and numeric data are correctly displayed by using the AX-800P, AX-110G or calibration gas.	Remove the cause if the waveform and numeric data are not displayed correctly.
Alarm function	Check that the alarm function works correctly.	Remove the cause if the alarm function has a problem.
BP zeroing and comparison with mercury manometer	Check that the zeroing and comparison with mercury manometer has no error.	Remove the cause if there is an error.
NIBP air leak	Check that the cuff and hose has no air leak.	Replace the cuff or hose if there is any air leak.

Recorder

Item	Check Procedure	Action at Error Occurrence
Paper feeding	Check that the recorder feeds the paper correctly.	Remove the cause if there is any problem.
Printing	Check that the recorder prints the waveforms and alphanumeric data correctly.	Remove the cause if there is any problem.
Abnormal sound	Check that there is no abnormal sound in the recorder.	Remove the cause if there is any abnormal sound.

Backup

Item	Check Procedure	Action at Error Occurrence
Backup of system setup setting	Check that the setting data is correctly stored after the power off for 2 hours or more.	Contact Nihon Kohden.
Backup of alarm setting	Check that the setting data is correctly stored after turning on the instrument for 30 minutes or more and turning off for 2 hours or more.	Contact Nihon Kohden
Backup of real time clock	Check that the date and time is updated after the power off for 10 minutes or more.	Contact Nihon Kohden.

Others

Item	Check Procedure	Action at Error Occurrence
External device	Check that the external device is correctly connected to the instrument according to the operator's manual.	Follow the operator's manual.
Installation location	Check that the instrument is correctly installed in a suitable location according to the operator's manual.	Follow the operator's manual.

Cut here

Maintenance Check Sheet

Fill out and save this check sheet each time you do maintenance or service. Circle each item.

Date: _____

Customer: _____

Customer Address: _____

Service Personnel: _____ Service Company: _____

Instrument Name: Bedside Monitor Instrument Model: BSM-9510J ☐ K ☐

Instrument Serial Number: _____ Hardware Revision: _____

Software Version: _____

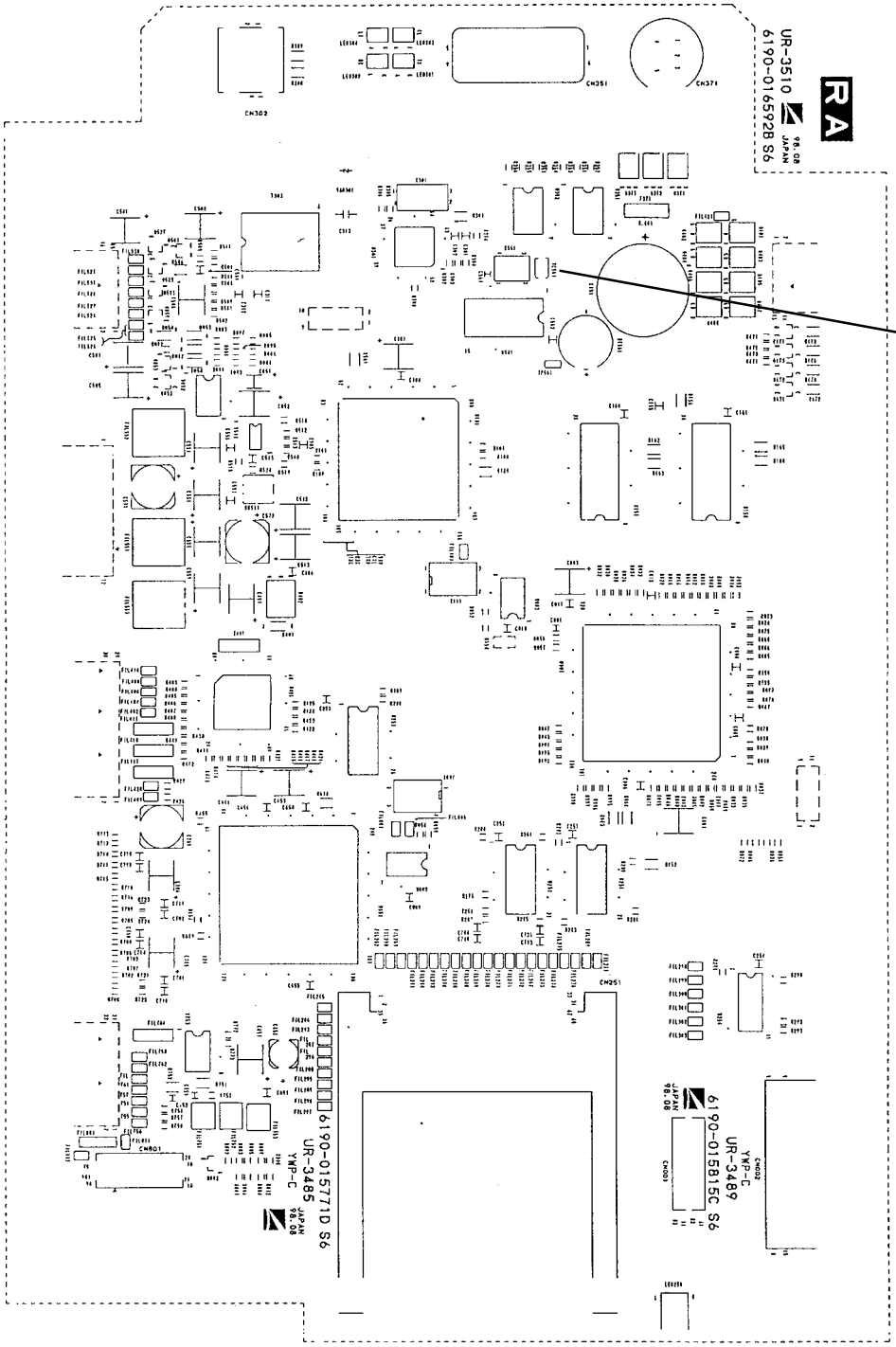
External	Outside of instrument is clean.	Yes	No
	All screws are tight.	Yes	No
	Instrument is not physically damaged and has no bent parts.	Yes	No
	The warning and caution labels are clearly readable	Yes	No
Safety	Power cord and ground lead are not damaged.	Yes	No
	Instrument is grounded to the dedicated grounding terminal.	Yes	No
	Fuse is not blown.	Yes	No
	Undamaged and correct fuse is used.	Yes	No
	Correct AC power is used.	Yes	No
	Protective earth resistance is within prescribed range.	Yes	No
	Earth leakage current is within prescribed range.	Yes	No
	Enclosure leakage current is within prescribed range.	Yes	No
	Patient leakage current is within prescribed range.	Yes	No
	Instrument can withstand prescribed withstand voltage.	Yes	No
Modules	Input parts on the modules have no poor contact.	Yes	No
Display	Brightness is correctly adjusted.	Yes	No
	LCD display is not dirty or damaged.	Yes	No
Measuring Parameters	Waveforms and numeric data are correctly displayed.	Yes	No
	Alarm functions correctly.	Yes	No
	BP zeroing is correct.	Yes	No
	NIBP cuff and hose has no air leak.	Yes	No
Recorder	Specified recording paper is used.	Yes	No
	Recorder does not make abnormal sounds or record at an incorrect speed, and paper does not skew.	Yes	No
	There are no missing dots on the recording.	Yes	No
	The date and time are correctly recorded.	Yes	No
Backup	System settings, alarm settings, and date and time are correctly backed up.	Yes	No
Others	External device is correctly connected.	Yes	No
	Instrument is correctly installed in a suitable location.	Yes	No

Section 7 Adjustment

Only the following adjustment is necessary. This adjustment can be done locally. A frequency counter is necessary for this adjustment.

VC561 on the MAIN board

Adjust the variable capacitor VC561 so that the frequency counter reads 2.000000 ± 0.000022 Hz between the test points TP561 (SQW) and TP851 (DGND).



Section 8 Replaceable Parts List

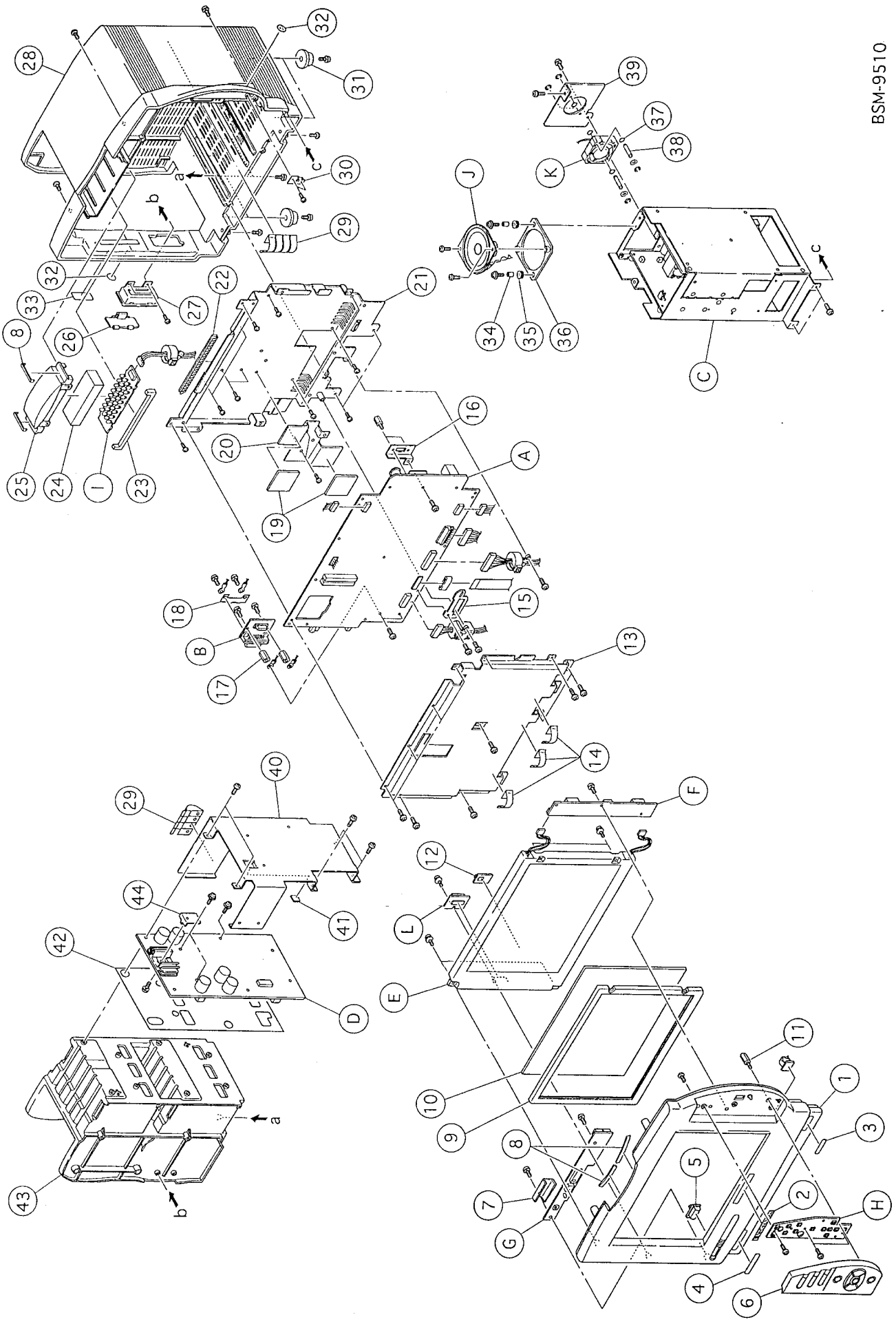
Main Unit Parts 8.1

When ordering parts or accessories from your Nihon Kohden Corporation distributor, please quote the NK code number and part name which are listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs. Always use Nihon Kohden parts and accessories to assure maximum performance from your instrument.

Main Unit Parts

Index	NK Code No.	Qty	Description	
1	6141-000665A	1	Front cover assy	フロントカバASSY
2	6124-025928	1	NIHON KOHDEN plate	シャメイプレート56 (721)
3	6124-028533	1	Model number label	BSM-9510 カタシキラベル
4	6124-027409B	1	Power off attention panel	デンゲンチュウイパネルA
5	6114-073556B	1	Key top cover	キートップ
6	6143-009278	1	Control panel assy 2	MU-950RA ソウサブASSY2
7	6114-084936	1	IR sensor holder	IRDAコテイカナグ
8	6114-085677	4	Alarm indicator packing	アラームインジケータパッキン
9	6113-026387D	1	Packing	フィルタパッキン
10	6114-081208A	1	LCD filter	LCDフィルタ
11	127997	1	Spacer bolt	カンカクボルトUN18-2102-0005 (L9)
12	132777	1	Flat cable clip	ミニフラットケーブルクリップFCA-10
13	6112-009906B	1	Shield case 2	シールドケース 2
14	6114-099617	3	Earth spring	ウルトラソフトフィンガ
15	6114-097869A	1	Ferrite core holder	コアホルダ
16	6114-081235B	1	Connector holder	コネクタホルダ
17	1114-176166	2	Spacer nut	カンカクナット L=13.2 (C1)
18	6114-094132	1	D-sub socket spring C	D-SUB コネクタバネC
19	6114-096282	2	Heat radiation sheet (38 × 38)	ホウネツシート (38×38)
20	6113-031274A	1	Heat sink	ホウネツバン
21	6112-009898E	1	Shield case 1	シールドケース 1
22	6114-080869	1	Earth spring	クリップフィンガ
23	6114-080708A	1	Indicator packing	インジケータパッキン
24	6114-084963	1	Alarm indicator reflection cheet	アラームインジケータハンシャシート
25	6112-008649B	1	Alarm indicator	アラームインジケータ
26	6113-026378B	1	Socket cover	コネクタカバ
27	6113-026369B	1	JA socket holder	JA コネクタホルダ
28	6111-005075B	1	Rear cover	リアカバジョウチャクシジズ1
29	6114-099626	2	Earth spring	ウルトラソフトフィンガ(4レン)
30	6114-096371A	1	Front cover fixing metal fittings	フロントケツゴウカナグ
31	1114-167087B	4	Rubber foot	ゴムアシ
32	2229-000798A	2	Attention mark label	チュウイラベル
33	6124-027392A	1	Memory card attention panel	メモリカードパネルA
34	6114-100919	2	Collar	カラ
35	369085	2	Grommet	グロメットゴムブッシュ φ9
36	6114-100901	1	Speaker holder	スピーカホルダ

37	107243	4	O-ring	Oリング B-2401 (P-3) ダイニチ
38	6114-100759	2	Shaft	シャフト
39	6114-098779A	1	Fan holder	ファンホルダ
40	6112-011609A	1	Module case shield cover	JAシールドケース
41	6114-096273	1	Heat radiation sheet (10 × 10)	ホウネツシート(10 × 10)
42	6113-031292	1	Insulation sheet	マザーゼツエンシート
43	6111-005066A	1	Module case	モジュールケースジョウチャクシジズ
44	6114-073476	1	FET metal fittings	FETトリツケカナグ
A	UR-3485	1	MAIN Board	メインボード
B	UR-3489	1	EXT JA Board	EXT JA ボード
C	SC-036R	1	Power Supply Unit	電源ユニット
	371215	2	Fuse T4 A/250 V	ヒューズ 218 004
D	UR-3486	1	JA Motherboard	JAマザーボード
E	525121	1	LCD Unit	LCDユニット LQ10D41
			(Two backlight lamps are included)	
	540078	1	Backlight Lamp Set (2 pcs/set)	交換用ランプユニット LQ0B192
F	524826	1	DC-AC Inverter	DC-ACインバータ CXA-0217
G	UR-3487	1	IR DETECT Board	IR DETECT ボード
H	UR-3506	1	OPERATION Board	OPERATIONボード
I	UR-3393	1	LED Board	LEDボード
J	073662	1	Speaker	スピーカ マツシタ EAS-65P34S 160 Ω
K	558273	1	Fan	FAN F412R-12MA
L	UR-3504	1	LCD JUNC Board	LCD JUNCボード


BSM-9510

Section 9 Connector Pin Assignment

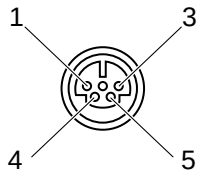
Input/Output Connector Pin Assignment 9.1
- Alarm Output Socket, ALARM 9.1
- General Serial Socket, SERIAL 9.1
- Network Socket, NETWORK 9.2
- JA Output Socket 9.2
- Connector on MAIN Board 9.2
- Connector on EXT JA Board 9.3
- Memory Card Connector 9.3
- OPERATION Connector 9.4
- LED Connector 9.4
- LCD Connector 9.5
- JA Motherboard Connector 9.5
- Connectors on the Power Supply Unit 9.6
- BDM Connector 9.6
- DEBUG Connector 9.7

Input/Output Connector Pin Assignment

CAUTION

- **When connecting an external instrument to the output jacks, ensure that the external instrument complies with the IEC60601-1 safety standard for medical equipment or IEC60601-2-27 particular requirements for the safety of electrocardiographic monitoring equipment. When the instrument does not comply with IEC60601-1 or IEC60601-2-27, use locally available medical use isolation transformer unit between the instrument and the AC outlet.**
- **The monitor should only be connected to an external instrument which complies with the IEC60601-1-2 or CISPR 11 Second Edition 1990-09, Group 1 and Class B standard.**

♦Alarm Output Socket, ALARM



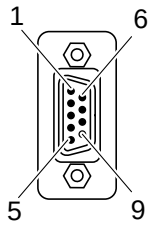
<Connector>

Round 6-pin connector Model HR12-10R-5SDL

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	YLRED	4	+12V
2	YLYELLOW	5	+12V
3	YLGREEN		

♦General Serial Socket, SERIAL



<Connector>

D sub 9-pin connector Model JES-9S-2A3B

<Connection Cable>

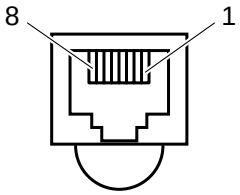
9P-9P serial cable Code no. YS-061P2

9P-25P serial cable Code no. YS-061P3

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	CD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	Not used
5	GND		

♦Network Socket, NETWORK



<Connector>

8-pin modular connector Model TM11R-3C-88

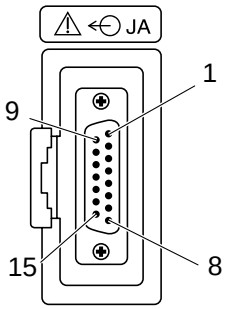
<Connection Cable>

4 twisted pair cable with shield

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	TX+	5	Not used
2	TX–	6	RX–
3	RX+	7	Not used
4	Not used	8	Not used

♦JA Output Socket



<Connectors>

Washer male 15-pin right angle Model JAY-15S-1A2G13-N

D sub 15-pin connector

<Connection Cables>

JA connection cable Code no. YJ-900P (0.4 m)

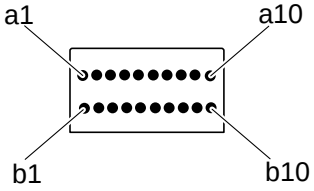
JA connection cable Code no. YJ-901P (2.5 m)

JA connection cable Code no. YJ-902P (5.0 m)

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	+24VOUT	9	Not used
2	E2	10	CNNTIN
3	RXIN+	11	Not used
4	RXIN–	12	Not used
5	TXOUT+	13	Not used
6	TXOUT–	14	Not used
7	CTLOUT+	15	Not used
8	CTLOUT–		

♦Connector on MAIN Board



<Connector>

Model XH3A2041-2A

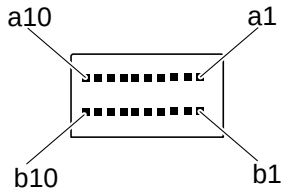
<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
a10	+24VOUT	b10	+24VOUT
a9	JGND	b9	JGND
a8	RXIN+	b8	RXIN–
a7	TXOUT+	b7	TXOUT–
a6	CTLOUT+	b6	CTLOUT–
a5	Not used	b5	CNNTIN
a4	Not used	b4	Not used
a3	Not used	b3	Not used
a2	Not used	b2	Not used
a1	Not used	b1	Not used

♦Connector on EXT JA Board

<Connector>

Model XH3B2041-A



<Pin Assignment>

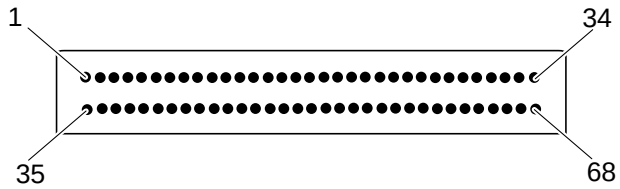
Pin No.	Signal Name	Pin No.	Signal Name
a10	+24VOUT	b10	+24VOUT
a9	JGND	b9	JGND
a8	RXIN+	b8	RXIN–
a7	TXOUT+	b7	TXOUT–
a6	CTLOUT+	b6	CTLOUT–
a5	Not used	b5	CNNTIN
a4	Not used	b4	Not used
a3	Not used	b3	Not used
a2	Not used	b2	Not used
a1	Not used	b1	Not used

♦Memory Card Connector

<Connector>

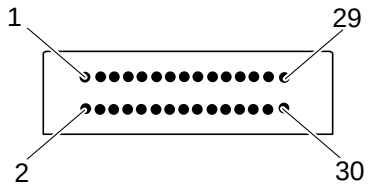
Model IC7-68PD-1.27SF-EJR-C

<Pin Assignment>



Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	DGND	18	+5VD (VPP1)	35	DGND	52	+5VD (VPP2)
2	MEMD03	19	MEMA16	36	XCD1	53	MEMA22
3	MEMD04	20	MEMA15 <GDISPOUT>	37	MEMD11	54	MEMA23
4	MEMD05	21	MEMA12 <GB1>	38	MEMD12	55	MEMA24
5	MEMD06	22	MEMA07 <GG0>	39	MEMD13	56	MEMA25
6	MEMD07	23	MEMA06 <GR3>	40	MEMD14	57	NC (RFU)
7	XMEMCE1	24	MEMA05 <GR2>	41	MEMD15	58	XMEMREST
8	MEMA10 <GG3>	25	MEMA04 <GR1>	42	XMEMCE2	59	XWAIT
9	XMEM0E	26	MEMA03 <GR0>	43	NC (RFSH)	60	NC (RFU)
10	MEMA11 <GB0>	27	MEMA02 <XGVSYNC>	44	NC (RFU)	61	REG
11	MEMA09 <GG2>	28	MEMA01 <XGHSYNC>	45	NC (RFU)	62	XBVD2
12	MEMA08 <GG1>	29	MEMA00 <GDCLK>	46	MEMA17	63	XBVD1
13	MEMA13 <GB2>	30	MEMD00	47	MEMA18	64	MEMD08
14	MEMA14 <GB3>	31	MEMD01	48	MEMA19	65	MEMD09
15	XMEMWE (XMEMPGM)	32	MEMD02	49	MEMA20	66	MEMD10
16	MEMRDY (XMEMBSY)	33	XWP	50	MEMA21	67	XCD2
17	+5VD	34	DGND	51	+5VD	68	DGND

♦OPERATION Connector



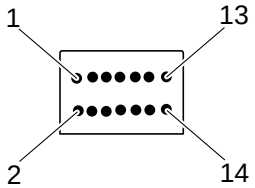
<Connector>

Model S30B-PHDSS

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	XRESET	16	+12VU
2	IRRXD	17	+12VU
3	IRBSY	18	+12VU
4	IRTXD	19	UGND
5	IRDTR	20	UGND
6	REMOTE	21	UGND
7	Not used	22	RETURN3
8	Not used	23	RETURN4
9	+5VD	24	RETURN5
10	+5VD	25	RETURN6
11	+5VS	26	SCAN0
12	Not used	27	SCAN1
13	DGND	28	SCAN2
14	DGND	29	SCAN3
15	+5VU	30	BLCNTL

♦LED Connector



<Connector>

Model DF11-14DP-2DS

<Pin Assignment>

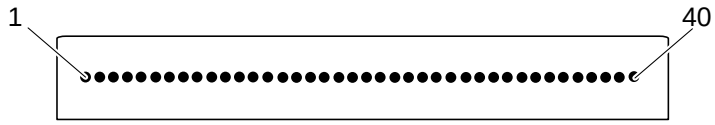
Pin No.	Signal Name	Pin No.	Signal Name
1	+12VU	8	LED06
2	+12VU	9	LED07
3	LED01	10	LED08
4	LED02	11	Not used
5	LED03	12	Not used
6	LED04	13	Not used
7	LED05	14	Not used

♦LCD Connector

<Connector>

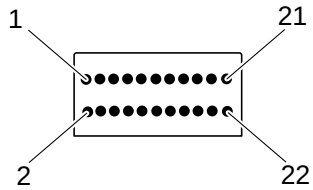
Model DF13-40PD-1.25V (59)

<Pin Assignment>



Pin No.	Signal Name	Pin No.	Signal Name
1	DGND	21	DGND
2	DGND	22	B0
3	DCLK	23	B0
4	XHSYNC	24	B0
5	XVSYNC	25	B1
6	DGND	26	B2
7	R0	27	B3
8	R0	28	DGND
9	R0	29	DISPOUT
10	R1	30	+5VD
11	R2	31	+5VD
12	R3	32	+5VD
13	DGND	33	DGND
14	G0	34	DGND
15	G0	35	Not used
16	G0	36	Not used
17	G1	37	Not used
18	G2	38	Not used
19	G3	39	Not used
20	DGND	40	Not used

♦JA Motherboard Connector



<Connector>

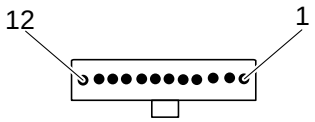
Model S22B-PHDSS

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	JRXIN	12	JCTLEN
2	MTXIN	13	JPCLKEN
3	MCTLIN	14	Not used
4	JNUMIN	15	VJA
5	JCNNTIN	16	VJA
6	MCLKIN	17	VJA
7	XJRESET	18	JGND
8	MRXOUT	19	JGND
9	JCTLOUT	20	JGND
10	MNUMOUT	21	+5VD
11	JTXEN	22	DGND

♦Connectors on the Power Supply Unit

Power supply line connector



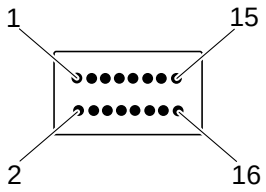
<Connector>

Model 1-171826-2

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	+5VD	7	Not used
2	+5VD	8	Not used
3	DGND	9	+24VC
4	DGND	10	CGND
5	+12VU	11	+VJA
6	UGND	12	JGND

Power supply status connector



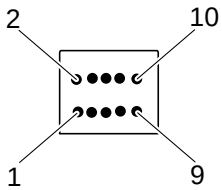
<Connector>

Model S16B-PHDSS

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	Not used	9	XC24CNT
2	Not used	10	XC240C
3	Not used	11	XC24RES
4	ACFSP	12	SGND
5	XACFAIL	13	+5VS
6	Not used	14	SGND
7	XPWSTT	15	SNDSIG
8	XPWDWN	16	SNDGND

♦BDM Connector



<Connector>

Model FFC-10BSM1

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name
1	DS	2	BERR
3	DGND	4	BKPT/DSCLK
5	DGND	6	FREEZE
7	RESET	8	IFETCH/DSI
9	+5VD	10	IPIPE/DS0

♦DEBUG Connector

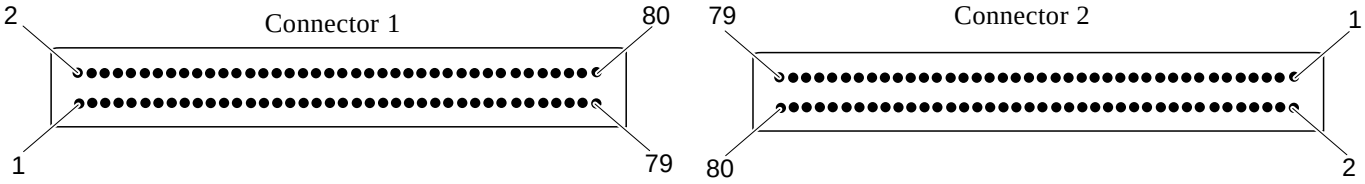
Connector 1

<Connector>

Model TFM-140-12-S-D-LC

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	A0	17	A15	33	D5	49	XCS2	65	SIZE0
2	A1	18	DGND	34	D6	50	XCS3	66	SIZE1
3	A2	19	A16	35	D7	51	XCS4	67	XDSACK0
4	A3	20	A17	36	D8	52	DGND	68	XDSACK1
5	DGND	21	A18	37	D9	53	XCS5	69	XAS
6	A4	22	A19	38	D10	54	XCS6	70	XDS
7	A5	23	A20	39	D11	55	Not used	71	XIPIPE0
8	A6	24	A21	40	DGND	56	FREEZE	72	XIFETCH
9	A7	25	A22	41	DGND	57	Not used	73	XBERR
10	A8	26	A23	42	D12	58	Not used	74	Not used
11	A9	27	D0	43	D13	59	Not used	75	XRESETH
12	A10	28	D1	44	D14	60	Not used	76	DGND
13	A11	29	DGND	45	D15	61	Not used	77	XIFETCH
14	A12	30	D2	46	XBERR	62	CKL01	78	XBKPT
15	A13	31	D3	47	XCS0	63	DGND	79	XIPIPE0
16	A14	32	D4	48	XCS1	64	RXW	80	FREEZE



Connector 2

<Connector>

Model TFM-140-12-S-D-LC

<Pin Assignment>

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	D16	17	D31	33	FC0	49	NC (ex11)	65	+5VD (VCC)
2	D17	18	DGND	34	FC1	50	NC (ex12)	66	+5VD (VCC)
3	D18	19	A24	35	FC2	51	NC (ex13)	67	+5VD (VCC)
4	D19	20	A25	36	FC3	52	DGND	68	+5VD (VCC)
5	DGND	21	A26	37	NC (ex1)	53	NC (ex14)	69	Not used
6	D20	22	A27	38	NC (ex2)	54	NC (ex15)	70	Not used
7	D21	23	A28	39	NC (ex3)	55	NC (ex16)	71	Not used
8	D22	24	A29	40	DGND	56	Not used	72	Not used
9	D23	25	A30	41	DGND	57	Not used	73	Not used
10	D24	26	A31	42	NC (ex4)	58	Not used	74	Not used
11	D25	27	XHALT	43	NC (ex5)	59	+5VD (VCC)	75	Not used
12	D26	28	XIPIPE1	44	NC (ex6)	60	+5VD (VCC)	76	DGND
13	D27	29	DGND	45	NC (ex7)	61	+5VD (VCC)	77	Not used
14	D28	30	XRESETH	46	NC (ex8)	62	+5VD (VCC)	78	Not used
15	D29	31	XAVEC	47	NC (ex9)	63	DGND	79	Not used
16	D30	32	XCS7	48	NC (ex10)	64	+5VD (VCC)	80	Not used